

Appendix 1 - Soil Properties

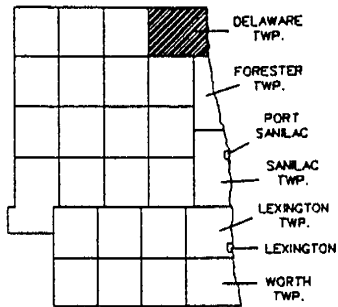
Huron County

Map Symbol	Soil Description	Farmland Soils	Highly Erodible Land (HEL)	Slope Range	Hydrologic Group	Septic Suitability
5	KILMANAGH LOAM	PRIME FARMLAND IF DRAINED	NOT HEL	FLAT	C	VERY LIMITED
23	FLUVAQUENTS, LOAMY	NOT PRIME FARMLAND	UNRANKED	FLAT	N/A	UNRANKED
31	BELLEVILLE LOAMY SAND	PRIME FARMLAND IF DRAINED	NOT HEL	FLAT	B/D	VERY LIMITED
11A	COVERT SAND, LOAMY SUBSTRATUM, 0 TO 2 PERCENT SLOPES	NOT PRIME FARMLAND	NOT HEL	A	A	VERY LIMITED
20A	COVERT SAND, 0 TO 2 PERCENT SLOPES	NOT PRIME FARMLAND	NOT HEL	A	A	VERY LIMITED
26B	BOYER LOAMY SAND, 0 TO 6 PERCENT SLOPES	NOT PRIME FARMLAND	NOT HEL	B	B	SOMEWHAT LIMITED
29A	PIPESTONE-TOBICO-ADRIAN COMPLEX, 0 TO 2 PERCENT SLOPES	FARMLAND OF LOCAL IMPORTANCE	NOT HEL	A	A	VERY LIMITED
36A	PIPESTONE SAND, 0 TO 2 PERCENT SLOPES	NOT PRIME FARMLAND	NOT HEL	A	A	VERY LIMITED
39A	RAPSON LOAMY SAND, 0 TO 2 PERCENT SLOPES	FARMLAND OF LOCAL IMPORTANCE	NOT HEL	A	B	VERY LIMITED
3A	SHEBEON LOAM, 0 TO 2 PERCENT SLOPES	PRIME FARMLAND IF DRAINED	NOT HEL	A	C	VERY LIMITED
40A	WASEPI LOAMY SAND, LOAMY SUBSTRATUM, 0 TO 2 PERCENT SLOPES	FARMLAND OF LOCAL IMPORTANCE	NOT HEL	A	B	VERY LIMITED
49B	GRINDSTONE-KILMANAGH LOAMS, 0 TO 4 PERCENT SLOPES	ALL AREAS ARE PRIME FARMLAND	NOT HEL	B	C	VERY LIMITED
4B	GRINDSTONE LOAM, 0 TO 4 PERCENT SLOPES	ALL AREAS ARE PRIME FARMLAND	NOT HEL	B	C	VERY LIMITED
6A	AVOCA LOAMY SAND, 0 TO 2 PERCENT SLOPES	FARMLAND OF LOCAL IMPORTANCE	NOT HEL	A	A	VERY LIMITED
7A	AUBARQUE LOAM, 0 TO 2 PERCENT SLOPES	FARMLAND OF LOCAL IMPORTANCE	NOT HEL	A	C/D	VERY LIMITED
7B	AUBARQUE LOAM, 2 TO 6 PERCENT SLOPES	FARMLAND OF LOCAL IMPORTANCE	NOT HEL	B	C/D	VERY LIMITED
w	WATER	UNRANKED	UNRANKED	N/A	N/A	UNRANKED

DELAWARE TOWNSHIP

HIGH RISK EROSION AREAS

SANILAC COUNTY



HIGH RISK EROSION AREAS

THE NUMBER REPRESENTS, IN FEET, THE
 60' 30 YEAR PROJECTED RECESSION DISTANCE.
 105' THE NUMBER REPRESENTS, IN FEET, THE
 60 YEAR PROJECTED RECESSION DISTANCE.

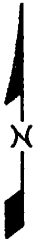
HIGH RISK EROSION AREA
 (shading alongshore)

THESE AREAS ARE LEGALLY DEFINED BY PART
 323, OF THE NATURAL RESOURCES AND
 ENVIRONMENTAL PROTECTION ACT OF 1994,
 P.A. 451 AS AMENDED, AS BEING GREAT LAKES
 SHORELAND AREAS DOCUMENTED TO RECEDE
 AN AVERAGE OF ONE FOOT OR MORE A YEAR.

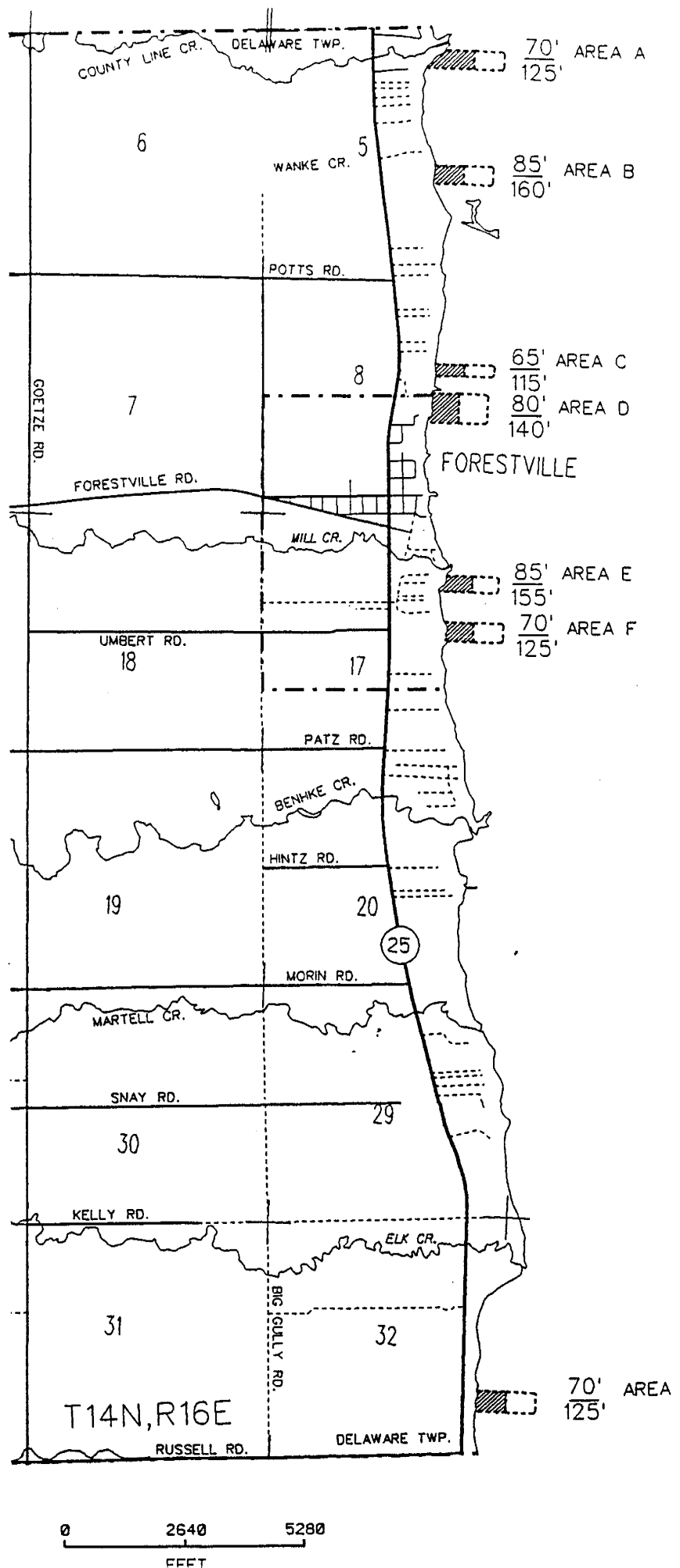
SOURCE

STATE OF MICHIGAN PART 323 OF ACT 451
 RATE MAPS

06-25-98



MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
 LAND AND WATER MANAGEMENT DIVISION
 P.O. BOX 30458
 LANSING, MI 48909-7958
 (517) 373-1950



**PROPERTY NUMBERS IN HIGH RISK EROSION AREAS
DELAWARE TOWNSHIP, SANILAC COUNTY
(arranged north to south)**

Date of Notification 07/10/98

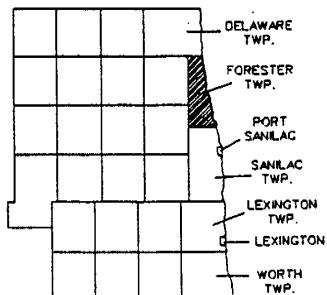
<u>SEQUENCE NO.</u>	<u>PROPERTY NO.</u>	<u>HREA G</u>	<u>30-yr. setback 70'</u> <u>60 yr. setback 125'</u>
<u>HREA A</u>	<u>30-yr. setback 70'</u> <u>60 yr. setback 125'</u>		
1262	76-062-140-000-016-00	1066 1065 1064.1 1064	76-061-032-400-010-00 76-061-110-000-010-00 76-061-110-000-009-00 76-061-110-000-008-00
<u>HREA B</u>	<u>30-yr. setback 85'</u> <u>60 yr. setback 160'</u>		
1247	76-061-005-300-030-03		
1245	76-061-005-300-030-00		
<u>HREA C</u>	<u>30-yr. setback 65'</u> <u>60 yr. setback 115'</u>		
1218	76-061-130-000-020-00		
1217	76-061-130-000-021-00		
<u>HREA D</u>	<u>30-yr. setback 80'</u> <u>60 yr. setback 140'</u>		
1214	76-062-200-010-004-00		
1210	76-062-200-010-003-00		
<u>HREA E</u>	<u>30-yr. setback 85'</u> <u>60 yr. setback 155'</u>		
1187	76-062-250-002-012-00		
1186.1	76-062-250-002-014-00		
1186	76-062-250-002-015-00		
1185.1	76-062-250-002-016-00		
1185	76-062-250-002-018-00		
<u>HREA F</u>	<u>30-yr. setback 70'</u> <u>60 yr. setback 125'</u>		
1179.1	76-062-250-002-031-00		
1175	76-062-017-400-010-00		

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FORESTER TOWNSHIP

HIGH RISK EROSION AREAS

SANILAC COUNTY



HIGH RISK EROSION AREAS

THE NUMBER REPRESENTS, IN FEET, THE
60' 30 YEAR PROJECTED RECESSION DISTANCE.
105' THE NUMBER REPRESENTS, IN FEET, THE
60 YEAR PROJECTED RECESSION DISTANCE.

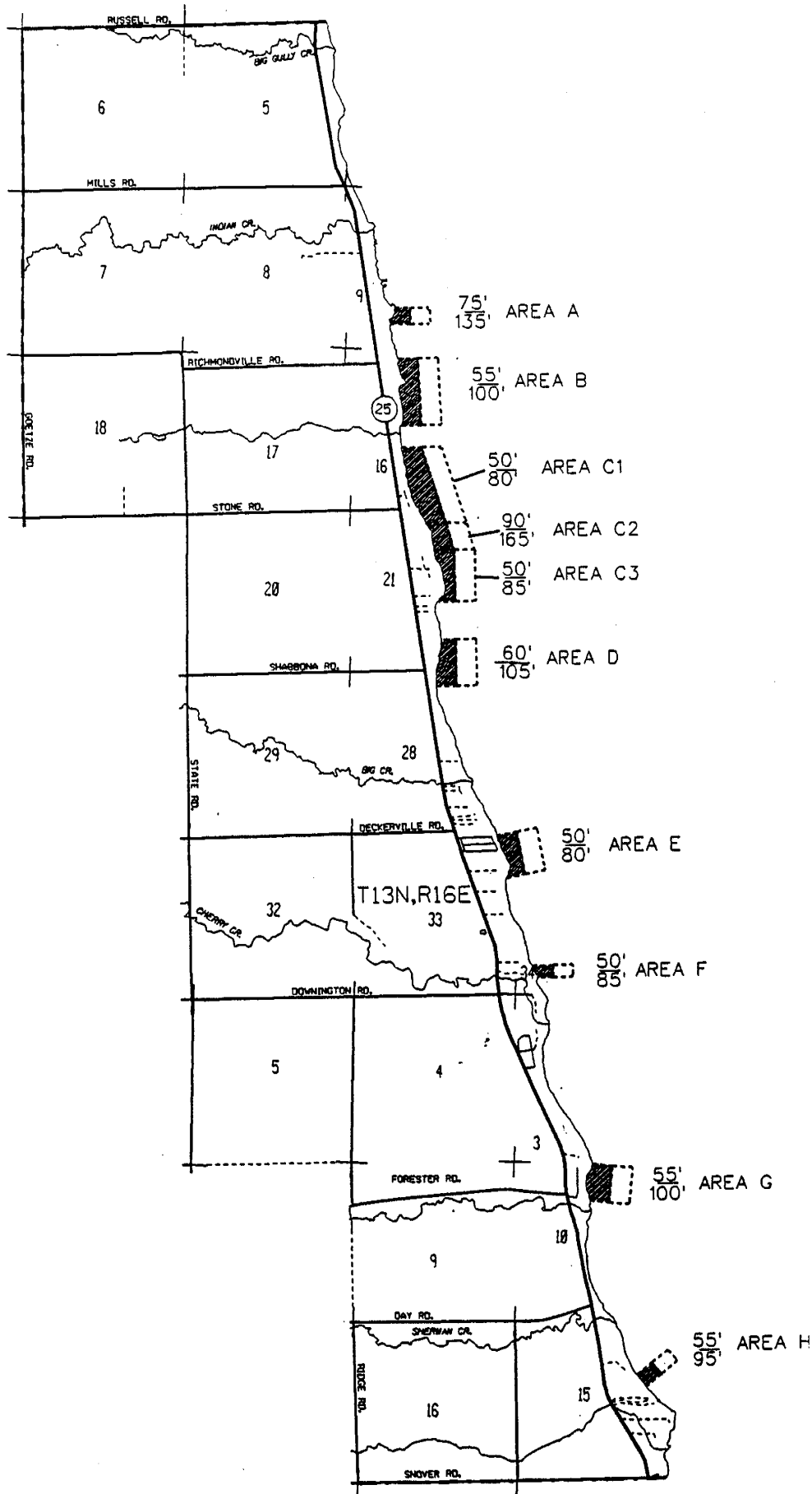
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(shading alongshore)

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P.A. 451 AS AMENDED, AS BEING GREAT LAKES
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SOURCE

STATE OF MICHIGAN PART 323 OF ACT 451
RATE MAPS

04-23-99



0 2500 5000
FEET



MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
LAND AND WATER MANAGEMENT DIVISION
P.O. BOX 30458
LANSING, MI 48909-7958
(517) 373-1950

**PROPERTY NUMBERS IN HIGH RISK EROSION AREAS
FORESTER TOWNSHIP, SANILAC COUNTY
(arranged north to south)**

Date of Notification 07/10/98, amended 04/30/99

<u>SEQUENCE NO.</u>	<u>PROPERTY NO.</u>	<u>HREA C1</u>	<u>30-yr. setback 50'</u> <u>60 yr. setback 80'</u>
<u>HREA A</u>	<u>30-yr. setback 75'</u> <u>60 yr. setback 135'</u>		
995	76-111-009-100-300-00	965	76-111-016-100-530-00
994.1	76-111-009-100-320-00	964	76-111-016-100-540-00
994	76-111-009-100-310-00	963.1	76-111-016-100-550-00
993	76-111-009-100-310-01	962	76-111-016-100-560-00
		961	76-111-016-100-570-00
		960.1	76-111-016-100-580-00
		960	76-111-016-100-590-00
		959.2	76-111-016-100-600-00
<u>HREA B</u>	<u>30-yr. setback 55'</u> <u>60 yr. setback 100'</u>	959.1	76-111-016-100-610-00
984	76-111-016-100-120-00	959	76-111-016-100-620-00
983.1	76-111-016-100-220-00	958.1	76-111-016-100-630-00
983	76-111-016-100-290-00	958	76-111-120-000-014-00
982.1	76-111-016-100-280-00	957.1	76-111-120-000-013-00
982	76-111-016-100-260-00	957	76-111-120-000-012-00
980	76-111-016-100-270-00	956.1	76-111-120-000-011-00
978.3	76-111-016-100-490-00	956	76-111-120-000-010-00
978.2	76-111-016-100-480-00	955.1	76-111-120-000-009-00
978.1	76-111-016-100-470-00	955	76-111-120-000-008-00
978	76-111-016-100-460-00	954.2	76-111-120-000-007-00
977	76-111-016-100-450-00	954.1	76-111-120-000-006-00
976.2	76-111-016-100-440-00	954	76-111-120-000-005-00
976.1	76-111-016-100-430-00	953.2	76-111-120-000-004-00
976	76-111-016-100-420-00	953.1	76-111-120-000-003-00
975.1	76-111-016-100-410-00	953	76-111-120-000-002-00
975	76-111-016-100-400-00	952.1	76-111-120-000-001-00
974.1	76-111-016-100-390-00		
974	76-111-016-100-380-00	<u>HREA C2</u>	<u>30-yr. setback 90'</u> <u>60 yr. setback 165'</u>
973.1	76-111-016-100-370-00	947.1	76-111-121-100-140-01
973	76-111-016-100-360-00	947	76-111-021-100-140-00
972.1	76-111-016-100-350-00	945.1	76-111-021-100-140-01
972	76-111-016-100-340-00	945	76-111-021-100-140-02
971.1	76-111-016-100-330-00	944	76-111-021-100-140-03
971	76-111-016-100-320-00		
970.1	76-111-016-100-310-00		

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**PROPERTY NUMBERS IN HIGH RISK EROSION AREAS
FORESTER TOWNSHIP, SANILAC COUNTY
(arranged north to south)**

Date of Notification 07/10/98, amended 04/30/99

<u>SEQUENCE NO.</u>	<u>PROPERTY NO.</u>		
	30-yr. setback 50'	920	76-111-192-000-005-00
	60 yr. setback 85'	919.1	76-111-192-000-004-00
<u>HREA C3</u>		919	76-111-192-000-003-00
		918.3	76-111-192-000-003-01
		918.3	76-111-192-000-002-00
943.1	76-111-150-000-021-00	918.1	76-111-192-000-002-01
943	76-111-150-000-019-00	918	76-111-192-000-001-00
942.1	76-111-150-000-018-00	917.2	76-111-192-000-001-01
942	76-111-150-000-017-00	917	76-111-028-100-020-00
940.5	76-111-150-000-016-00	916	76-111-028-100-030-00
940.4	76-111-150-000-015-00	915	76-111-028-100-040-00
940.3	76-111-150-000-014-00	914.1	76-111-028-100-050-00
940.2	76-111-150-000-013-01		
940.1	76-111-150-000-011-00		30-yr. setback 50'
940	76-111-150-000-010-00	<u>HREA E</u>	<u>60 yr. setback 80'</u>
939.1	76-111-150-000-008-00		
939	76-111-150-000-007-00	882.1	76-111-170-004-022-00
938.1	76-111-150-000-005-00	878	76-111-170-001-020-00
938	76-111-150-000-003-00	877	76-111-033-100-030-00
937	76-111-150-000-001-00	876	76-111-033-100-030-02
936.1	76-111-021-100-120-00	875	76-111-033-100-060-00
936	76-111-021-100-120-02	874.1	76-111-033-100-090-00
935.1	76-111-021-100-130-00	874	76-111-033-100-040-00
935	76-111-193-000-002-01		
934	76-111-193-000-001-00		30-yr. setback 50'
933.1	76-111-193-000-003-00	<u>HREA F</u>	<u>60 yr. setback 85'</u>
933	76-111-193-000-004-00		
	30-yr. setback 60'	854	76-111-033-400-190-00
<u>HREA D</u>	<u>60 yr. setback 105'</u>	853	76-111-033-400-200-00
		852	76-111-033-400-210-00
924	76-111-192-000-011-00		
923.1	76-111-192-000-010-01		
923	76-111-192-000-010-00		
922.1	76-111-192-000-009-00		
922	76-111-192-000-008-00		
921.1	76-111-192-000-007-00		
921	76-111-192-000-007-01		
920.1	76-111-192-000-006-01		
920.1	76-111-192-000-006-00		

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Date of Notification 07/10/98, amended 04/30/99

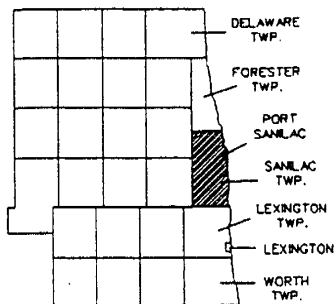
<u>SEQUENCE NO.</u>	<u>PROPERTY NO.</u>
	30-yr. setback 55'
<u>HREA G</u>	<u>60 yr. setback 100'</u>
809.2	76-110-010-300-140-00
809.1	76-110-010-300-150-00
808.2	76-111-100-000-011-00
808.1	76-111-100-000-010-00
808	76-111-100-000-009-00
807.2	76-111-100-000-008-00
807.1	76-111-100-000-007-00
807	76-111-100-000-006-00
806.2	76-111-100-000-005-00
806.1	76-111-100-000-004-00
805.1	76-111-100-000-002-00
805	76-111-100-000-001-00
804	76-110-010-300-240-00
	30-yr. setback 55'
<u>HREA H</u>	<u>60 yr. setback 95'</u>
764	76-110-015-200-030-00
763.2	76-110-015-200-040-00
763.1	76-110-015-200-050-00
763	76-110-015-200-060-00
762	76-110-015-400-130-00

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SANILAC TOWNSHIP

HIGH RISK EROSION AREAS

SANILAC COUNTY



HIGH RISK EROSION AREAS

THE NUMBER REPRESENTS, IN FEET, THE
 30 YEAR PROJECTED RECESSION DISTANCE.
 60' THE NUMBER REPRESENTS, IN FEET, THE
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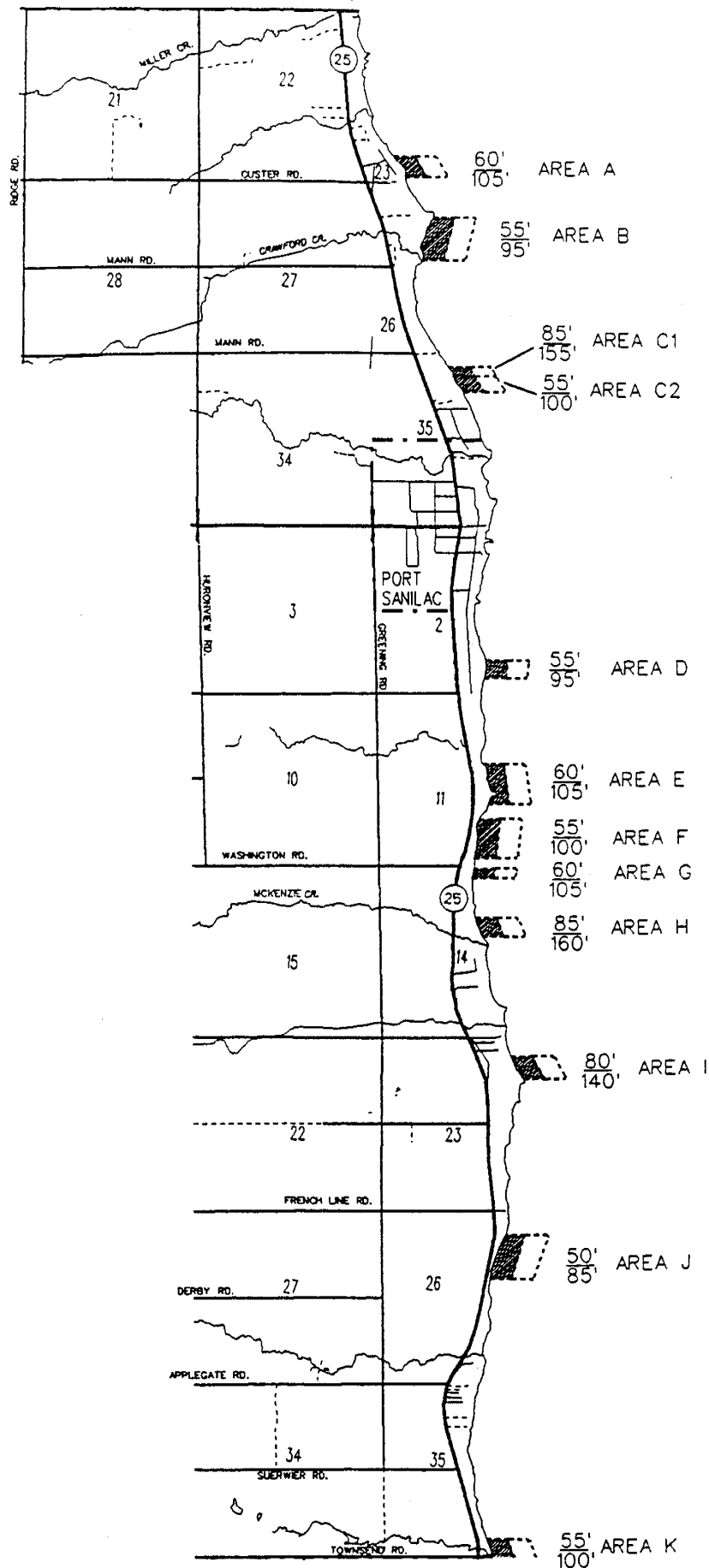
HIGH RISK EROSION AREA
 (shading alongshore)

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SOURCE

STATE OF MICHIGAN PART 323 OF ACT 451
 RATE MAPS

06-18-98



MICHIGAN
 DEPARTMENT OF ENVIRONMENTAL QUALITY

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
 LAND AND WATER MANAGEMENT DIVISION
 P.O. BOX 30458
 LANSING, MI 48909-7958
 (517) 373-1950

0 2500 5000
 FEET

**PROPERTY NUMBERS IN HIGH RISK EROSION AREAS
SANILAC TOWNSHIP, SANILAC COUNTY
(arranged north to south)**

Date of Notification 07/10/98

<u>SEQUENCE NO.</u>	<u>PROPERTY NO.</u>		
	30-yr. setback 60'	<u>HREA C2</u>	30-yr. setback 55'
	60 yr. setback 105'		60 yr. setback 100'
<u>HREA A</u>		666	76-211-035-200-020-00
710	76-211-160-000-010-00	665.1	76-211-035-200-060-00
709.3	76-211-160-000-011-00	665	76-211-035-200-070-00
709.2	76-211-160-000-012-00	664	76-211-035-200-080-00
709.1	76-211-160-000-013-00		30-yr. setback 55'
709	76-211-160-000-014-00	<u>HREA D</u>	60 yr. setback 95'
708.2	76-211-160-000-015-00	608.1	76-212-250-002-040-00
708.1	76-211-160-000-016-00	607	76-212-250-002-042-00
708	76-211-160-000-017-01	606	76-212-250-002-050-00
707.1	76-211-160-000-018-00	605.1	76-212-250-002-052-00
706	76-211-022-400-420-00		
	30-yr. setback 55'		30-yr. setback 60'
<u>HREA B</u>	60 yr. setback 95'	<u>HREA E</u>	60 yr. setback 105'
698	76-211-140-000-005-00	587	76-210-011-100-230-00
697.1	76-211-140-000-006-00	586.1	76-210-011-100-240-02
697	76-211-140-000-007-00	586	76-210-011-100-240-00
696	76-211-140-000-008-00	585	76-210-011-100-250-00
695.1	76-211-140-000-009-00	584.1	76-210-011-100-260-00
695	76-211-140-000-010-00	582	76-210-011-300-030-00
694	76-211-140-000-011-00	581.1	76-210-011-300-070-00
693	76-211-140-000-012-00	581	76-210-011-300-080-00
692.1	76-211-140-000-013-00	580	76-210-011-300-090-01
692	76-211-140-000-014-00	579.1	76-210-011-300-090-00
691	76-211-140-000-015-00	579	76-210-011-300-100-00
690.1	76-211-140-000-016-00		30-yr. setback 55'
690	76-211-140-000-017-00	<u>HREA F</u>	60 yr. setback 100'
	30-yr. setback 85'		
<u>HREA C1</u>	60 yr. setback 155'	567	76-210-011-300-180-00
668	76-211-035-200-010-00		
667.1	76-211-035-200-040-00		
667	76-211-035-200-030-00		

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SANILAC TOWNSHIP, SANILAC COUNTY
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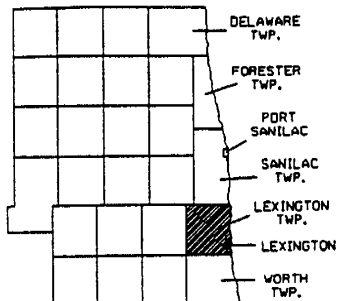
<u>SEQUENCE NO.</u>	<u>PROPERTY NO.</u>
<u>HREA G</u>	30-yr. setback 60' <u>60 yr. setback 105'</u>
565	76-210-014-100-020-00
564	76-210-014-100-030-00
563.1	76-210-014-100-050-00
<u>HREA H</u>	30-yr. setback 85' <u>60 yr. setback 160'</u>
555	76-210-014-100-110-00
554.1	76-210-014-100-100-00
548	76-210-014-100-130-00
<u>HREA I</u>	30-yr. setback 80' <u>60 yr. setback 140'</u>
527	76-210-023-100-100-00
526.1	76-210-023-100-110-00
526	76-210-023-100-120-00
525	76-210-023-100-140-00
<u>HREA J</u>	30-yr. setback 50' <u>60 yr. setback 85'</u>
490.1	76-211-060-001-014-00
484	76-211-060-002-001-00
479	76-211-090-000-001-00
<u>HREA K</u>	30-yr. setback 55' <u>60 yr. setback 100'</u>
428	76-210-035-300-170-00
427.1	76-210-035-300-180-00
427	76-210-035-300-200-00
426.1	76-210-035-300-190-00
426	76-210-035-300-210-00

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LEXINGTON TOWNSHIP

HIGH RISK EROSION AREAS

SANILAC COUNTY



HIGH RISK EROSION AREAS

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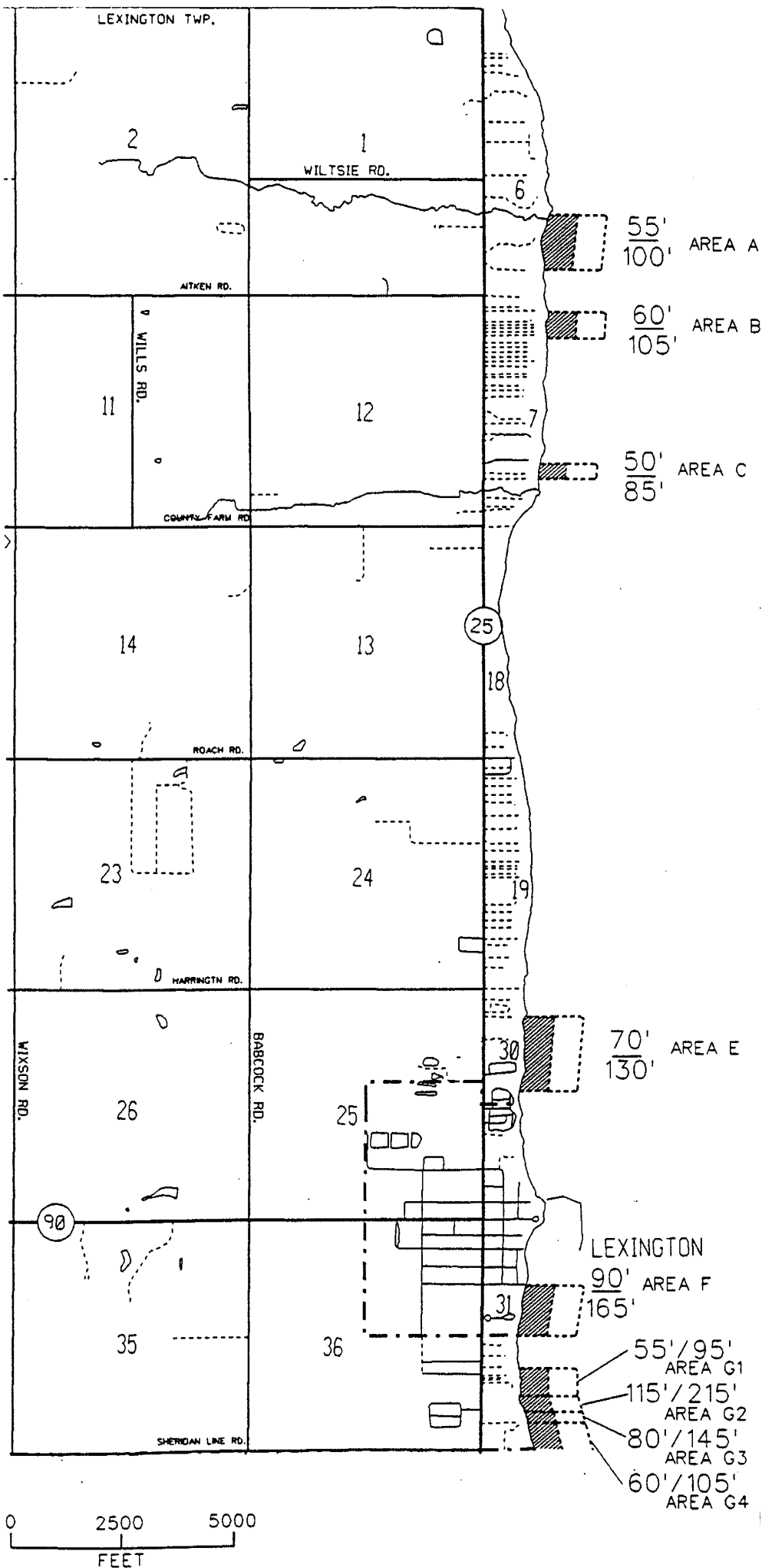
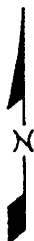
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SOURCE

STATE OF MICHIGAN PART 323 OF ACT 451
 RATE MAPS

REVISED 1/8/99



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 LAND AND WATER MANAGEMENT DIVISION
 P.O. BOX 30458
 LANSING, MI 48909-7958
 (517) 373-1950

PROPERTY NUMBERS IN HIGH RISK EROSION AREAS
LEXINGTON TOWNSHIP, SANILAC COUNTY
(arranged north to south)

Date of Notification 07/10/98, revised 1/8/99

<u>SEQUENCE NO.</u>	<u>PROPERTY NO.</u>		
	<u>30-yr. setback 55'</u> <u>60 yr. setback 100'</u>	<u>HREA E</u>	<u>30-yr. setback 70'</u> <u>60 yr. setback 130'</u>
<u>HREA A</u>			
	76-151-006-300-050-00	268	76-151-130-000-001-00
389	76-151-006-300-060-00	267.12	76-151-130-000-027-00
388	76-151-006-300-060-01	267.02	76-151-130-000-028-00
387	76-151-006-300-060-02	266.22	76-151-130-000-029-00
386		266.12	76-151-130-000-030-00
		265.1	76-151-130-000-062-00
	<u>30-yr. setback 60'</u> <u>60 yr. setback 105'</u>	263	76-151-180-000-013-00
<u>HREA B</u>		262	76-152-030-300-010-00
	76-151-007-200-060-00		<u>30-yr. setback 90'</u> <u>60 yr. setback 165'</u>
379	76-151-007-200-070-00	<u>HREA F</u>	
378	76-151-007-200-080-00		
377.1	76-151-007-200-090-00	232.02	76-152-031-200-080-00
377	76-151-007-200-100-00	232	76-152-031-200-090-00
376.1	76-151-007-200-110-00	231.2	76-152-031-200-100-00
376		231.1	76-152-031-200-110-00
	<u>30-yr. setback 50'</u> <u>60 yr. setback 85'</u>		<u>30-yr. setback 90'</u> <u>60 yr. setback 165'</u>
<u>HREA C</u>		<u>HREA F</u>	
	76-151-007-300-070-00		
356	76-151-110-000-018-00	230.9	76-152-031-200-130-09
355.1	76-151-110-000-017-00	230.8	76-152-031-200-130-08
355	76-151-110-000-016-00	230.7	76-152-031-200-130-07
354.1		230.6	76-152-031-200-130-06
	<u>30-yr. setback 70'</u> <u>60 yr. setback 130'</u>	230.5	76-152-031-200-130-05
<u>HREA E</u>		230.3	76-152-031-200-130-03
	76-151-030-100-050-00	230.2	76-152-031-200-130-02
272.2	76-151-030-100-060-00	230.14	76-152-031-200-130-14
272.1	76-151-030-100-060-01	230.12	76-152-031-200-130-12
272	76-151-030-100-070-00	230.11	76-152-031-200-130-11
271	76-151-030-100-100-00	230.1	76-152-031-200-130-01
270	76-151-030-100-110-00	230.01	76-152-031-200-130-10
269	76-151-030-100-111-00	229	76-152-031-200-145-00
268.1	76-151-130-000-003-00	227	76-152-031-200-160-00
268.03	76-151-130-000-002-00	226	76-152-031-200-180-00
268.02		225	76-152-031-200-190-00

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**PROPERTY NUMBERS IN HIGH RISK EROSION AREAS
LEXINGTON TOWNSHIP, SANILAC COUNTY
(arranged north to south)**

Date of Notification 07/10/98, revised 1/8/99

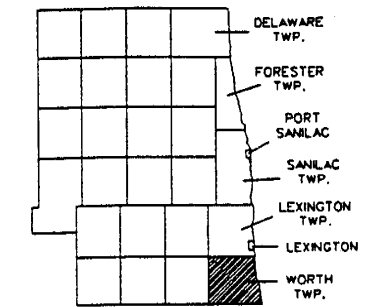
<u>SEQUENCE NO.</u>	<u>PROPERTY NO.</u>
<u>HREA G1</u>	30-yr. setback 55' <u>60 yr. setback 95'</u>
219	76-151-031-300-090-00
218.1	76-151-031-300-100-00
218	76-151-031-300-110-00
217.2	76-151-031-300-120-00
217.1	76-151-031-300-150-00
217	76-151-031-300-160-00
216.1	76-151-031-300-170-00
216	76-151-031-300-180-00
<u>HREA G2</u>	30-yr. setback 115' <u>60 yr. setback 215'</u>
215	76-151-031-300-190-01
214	76-151-031-300-190-00
<u>HREA G3</u>	30-yr. setback 80' <u>60 yr. setback 145'</u>
213	76-151-031-300-200-00
212	76-151-031-300-210-00
<u>HREA G4</u>	30-yr. setback 60' <u>60 yr. setback 105'</u>
211.1	76-151-031-300-230-00
211	76-151-031-300-240-00
210	76-151-031-300-220-03
209	76-151-031-300-220-02
208.1	76-151-031-300-220-00
208	76-151-031-300-280-00

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WORTH TOWNSHIP

HIGH RISK EROSION AREAS

SANILAC COUNTY



HIGH RISK EROSION AREAS

THE NUMBER REPRESENTS, IN FEET, THE 30 YEAR PROJECTED RECESSION DISTANCE.
THE NUMBER REPRESENTS, IN FEET, THE 60 YEAR PROJECTED RECESSION DISTANCE.

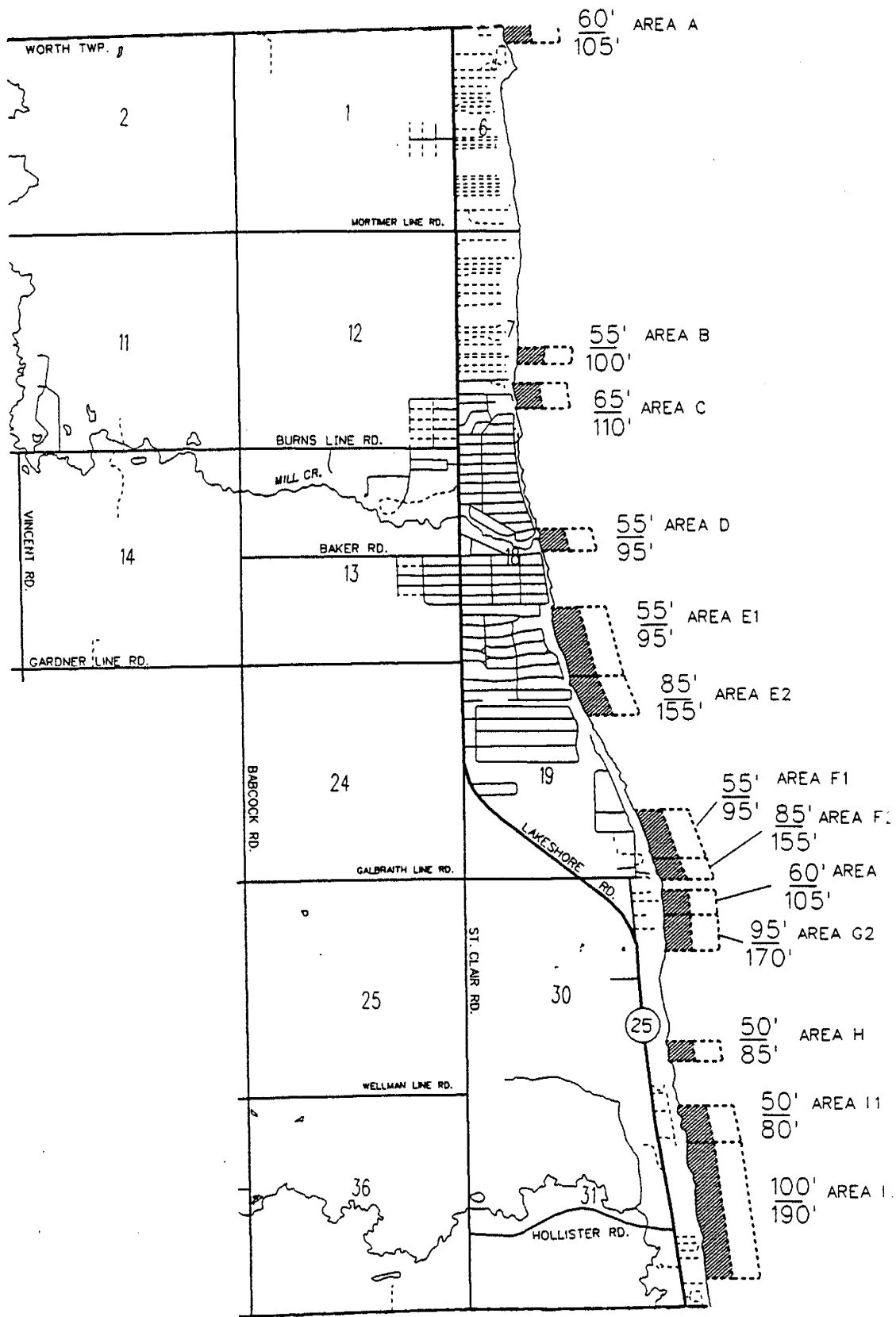
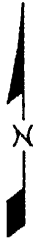
HIGH RISK EROSION AREA (shading alongshore)

THESE AREAS ARE LEGALLY DEFINED BY PART 323, OF THE NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION ACT OF 1994, P.A. 451 AS AMENDED, AS BEING GREAT LAKES SHORELAND AREAS DOCUMENTED TO RECEDE AN AVERAGE OF ONE FOOT OR MORE A YEAR.

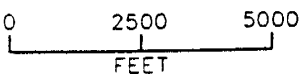
SOURCE

STATE OF MICHIGAN PART 323 OF ACT 451 RATE MAPS

REVISED 1/8/99



MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
LAND AND WATER MANAGEMENT DIVISION
P.O. BOX 30458
LANSING, MI 48909-7958
(517) 373-1950



**PROPERTY NUMBERS IN HIGH RISK EROSION AREAS
WORTH TOWNSHIP, SANILAC COUNTY**
(arranged north to south)

Date of Notification 07/10/98, revised 1/8/99

<u>SEQUENCE NO.</u>	<u>PROPERTY NO.</u>		<u>30-yr. setback 55'</u> <u>60 yr. setback 95'</u>
		<u>HREA E1</u>	
<u>HREA A</u>	30-yr. setback 60'		
	<u>60 yr. setback 105'</u>		
	205.4	113.1	76-261-310-000-001-00
	205.3	113	76-261-310-000-002-00
	205.2	112.1	76-261-310-000-004-00
	205.1	112	76-261-310-000-005-00
	205	111	76-261-310-000-007-00
		110	76-261-310-000-010-00
		109.1	76-261-310-000-011-00
		109	76-261-310-000-013-00
<u>HREA B</u>	30-yr. setback 55'	108.1	76-261-310-000-015-00
	<u>60 yr. setback 100'</u>	107.1	76-261-310-000-229-00
	155.1	107	76-261-310-000-234-00
	155	106	76-261-310-000-306-00
	154.2	105.1	76-261-310-000-308-00
	154.1	105	76-261-310-000-309-00
	154	104	76-261-310-000-385-00
	153	103.3	76-261-310-000-386-00
	152.1	103.2	76-261-310-000-387-00
		103.1	76-261-310-000-388-00
		<u>HREA E2</u>	
<u>HREA C</u>	30-yr. setback 65'		<u>30-yr. setback 85'</u>
	<u>60 yr. setback 110'</u>		<u>60 yr. setback 155'</u>
	149.1	102	76-261-310-000-464-00
	149	101.1	76-261-310-000-466-00
	148.1	101	76-261-310-000-467-00
	148	100.1	76-261-310-000-546-00
<u>HREA D</u>	146	100.02	76-261-310-000-545-00
		100	76-261-310-000-547-00
	30-yr. setback 55'	99	76-261-310-000-548-00
	<u>60 yr. setback 95'</u>	98.1	76-261-070-000-122-00
	126	98	76-261-070-000-121-00
	123	97.1	76-261-070-000-120-00
		97	76-261-070-000-118-00
		96.1	76-261-070-000-117-00

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PROPERTY NUMBERS IN HIGH RISK EROSION AREAS
WORTH TOWNSHIP, SANILAC COUNTY
(arranged north to south)

Date of Notification 07/10/98, revised 1/8/99

<u>SEQUENCE NO.</u>	<u>PROPERTY NO.</u>		
	30-yr. setback 55'	67.1	76-261-270-000-010-00
	60 yr. setback 95'	67	76-261-270-000-011-00
<u>HREA F1</u>		66.1	76-261-270-000-012-00
81	76-261-140-000-019-00	66	76-261-270-000-013-00
80.1	76-261-140-000-017-00	65.2	76-261-270-000-015-00
80	76-261-140-000-016-00	65.1	76-261-270-000-016-00
79.2	76-261-140-000-015-00	65	76-261-270-000-017-00
79	76-261-140-000-013-00	64.2	76-261-270-000-018-00
78.2	76-261-140-000-011-00		30-yr. setback 95'
78.1	76-261-140-000-010-00	<u>HREA G2</u>	60 yr. setback 170'
78	76-261-140-000-009-00	64.1	76-261-270-000-019-00
76.3	76-261-140-000-007-00	64.01	76-261-270-000-020-00
76.2	76-261-140-000-006-00	64	76-261-270-000-020-01
76.1	76-261-140-000-005-00	63.2	76-261-270-000-021-00
76	76-261-140-000-004-00	63.1	76-261-270-000-022-00
75.1	76-261-140-000-003-00	63	76-261-270-000-023-00
75	76-261-140-000-002-00	62.2	76-261-270-000-024-00
74.1	76-261-140-000-001-00	62.1	76-261-270-000-025-00
74	76-261-150-000-001-00	62.01	76-261-270-000-026-00
	30-yr. setback 85'	62	76-261-270-000-026-01
<u>HREA F2</u>	60 yr. setback 155'	61.1	76-261-270-000-027-00
73.2	76-261-150-000-002-00	61	76-261-270-000-028-00
73.1	76-261-150-000-003-00	60.1	76-261-270-000-029-00
73	76-261-150-000-004-00	60	76-261-270-000-030-00
72.1	76-261-019-400-030-00	59.2	76-261-220-000-001-00
72	76-261-019-400-040-00	59.1	76-261-220-000-002-00
71.2	76-261-019-400-050-00	59	76-261-220-000-003-00
71.1	76-261-019-400-070-00	58.2	76-261-220-000-004-00
71	76-261-019-400-060-00		30-yr. setback 50'
70.1	76-261-270-000-001-00	<u>HREA H</u>	60 yr. setback 85'
	30-yr. setback 60'	42.3	76-261-030-100-350-00
<u>HREA G1</u>	60 yr. setback 105'	42.2	76-261-030-100-370-00
68	76-261-270-000-008-00	42.1	76-261-030-100-380-00
67.2	76-261-270-000-009-00	42	76-261-030-100-400-00
		41.2	76-261-030-100-390-00
		41.1	76-261-030-100-410-00

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**PROPERTY NUMBERS IN HIGH RISK EROSION AREAS
WORTH TOWNSHIP, SANILAC COUNTY
(arranged north to south)**

Date of Notification 07/10/98, revised 1/8/99

<u>SEQUENCE NO.</u>	<u>PROPERTY NO.</u>		
	30-yr. setback 50'	21	76-261-130-000-018-00
	60 yr. setback 85'	20.3	76-261-130-000-019-00
<u>HREA H</u>		20.2	76-261-130-000-020-00
		20.1	76-261-130-000-021-00
		20	76-261-130-000-022-00
41.02	76-261-030-100-420-01	19.1	76-261-130-000-023-00
41	76-261-030-100-420-00	19	76-261-130-000-025-00
		18.3	76-261-130-000-026-00
	30-yr. setback 50'	18.2	76-261-130-000-027-00
	60 yr. setback 80'	18.1	76-261-130-000-028-01
<u>HREA I1</u>		18	76-261-130-000-028-00
		17.21	76-261-130-000-029-00
33.1	76-261-090-002-007-00	17.2	76-261-130-000-029-04
32	76-261-090-001-017-00	17.1	76-261-130-000-030-00
31.2	76-261-090-001-015-00	17	76-261-130-000-031-00
31.1	76-261-090-001-014-00	16.2	76-261-130-000-032-00
31	76-261-090-001-012-00	16.1	76-261-130-000-033-00
30.1	76-261-090-001-011-00	16	76-261-130-000-034-00
30	76-261-090-001-010-00	15.2	76-261-130-000-035-00
28.2	76-261-090-001-008-00	15.1	76-261-130-000-036-00
28.1	76-261-090-001-005-00	15	76-261-130-000-037-00
28	76-261-090-001-004-00	14.1	76-261-130-000-038-00
		14	76-261-031-100-060-00
	30-yr. setback 100'	13.3	76-261-031-100-070-00
	60 yr. setback 190'	13.2	76-261-031-400-050-01
<u>HREA I2</u>		13.1	76-261-031-400-050-00
		13	76-261-031-400-060-00
27.1	76-261-090-001-002-00	12	76-261-031-400-070-00
27	76-261-090-001-001-00	11	76-261-031-400-080-00
26.1	76-261-130-000-001-00	8	76-261-031-400-100-00
26	76-261-130-000-003-0	7.1	76-261-031-400-110-00
25.2	76-261-130-000-004-00	7	76-261-031-100-040-00
25.1	76-261-130-000-005-00	6	76-261-031-100-080-00
25	76-261-130-000-006-00		
24.2	76-261-130-000-007-00		
24.1	76-261-130-000-008-00		
24	76-261-130-000-009-00		
23	76-261-130-000-011-00		
22.1	76-261-130-000-014-00		
22	76-261-130-000-015-00		
21.2	76-261-130-000-016-00		
21.1	76-261-130-000-017-00		

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**MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
SURFACE WATER QUALITY DIVISION**

Report of a Sanitary Wastewater Survey

Conducted

May 1, 2003

at

Worth Township

Sanilac County

Survey Summary

A sanitary survey was conducted in Worth Township on May 1, 2003 with cooperation from the Sanilac County Health Department. The results of this survey indicate that raw or inadequately treated sewage is being illegally discharged to surface waters at several locations, and that Water Quality Standards for Microorganisms may be routinely exceeded at these locations.

Purpose of Survey

The survey was conducted to determine whether discharges of raw or improperly treated sanitary sewage exist in Worth Township.

Survey Results

Sampling conditions on May 1, 2003, were very wet. Sampling was conducted immediately after a rain event and all tributaries sampled had moderate to high flows.

Tables 1 and 2 present the single event data for E. coli and Fecal Coliform bacteria samples in tabular format. Table 3 presents field data collected during the survey. Also attached are site location maps 1 and 2.

Coliform bacteria numbers sampled from discharge points indicate several concentrated sources of contamination to surface water with elevated Fecal Coliform and E. coli bacterial counts (stations 1, 3-10, 12, 17-22, 24-31). Elevated Fecal Coliform, and E. coli bacterial counts are indicators of untreated domestic wastes, and the probable presence of disease causing microorganisms, or pathogens.

Fecal Coliform bacteria counts over 400 organisms per 100 ml. in discharges to surface waters exceed Water Quality Standards promulgated under Part 31 of the Natural Resources and Environmental Protection Act, 1994 P.A. 451, "the Act", Rule 62 (3) of the Part 4 Rules. E. coli bacteria counts over 300 organisms per 100 ml in surface waters are above levels protective of total body contact recreation per Rule 62 (1) of the Act. E. coli bacteria counts over 1000 organisms per 100 ml in surface waters are above levels protective of partial body contact recreation per Rule 62 (2) of the Act.

A total of 31 fecal coliform samples were collected during the May 2003 survey. Using Michigan Water Quality Standards as a reference point, 25 samples (81%) were above the single event water quality standard of 400 organisms per 100 ml.

A total of 31 E. coli samples were collected during the May 2003 survey. Using Michigan Water Quality Standards as a reference point, 25 samples (81%) were above the single event water quality standard for total body contact of 300 organisms per 100 ml, and 12 samples (39%) were above the single event water quality standard for partial body contact of 1000 organisms per 100 ml.

Of the 15 storm sewers sampled that directly discharge into Lake Huron 12 (80%) had Fecal Coliform counts greater than Michigan's Water Quality Standards. This indicates an illegal discharge from these points.

Of the 7 tributaries sampled 6 (86%) had E. Coli counts greater than Michigan's Water Quality Standards. This indicates illegal discharges to these tributaries.

Discussion

Soil types within the survey area of Worth Township present a severe limitation for septic tank absorption fields. The United States Department of Agriculture, Soil Survey of Sanilac County, Michigan, identified the following restrictive soil features within the survey area: ponding, slow percolation, soil wetness, and poor filtration.

These soil limitations, seasonal high groundwater tables, small lot sizes, and the above survey results support the probable need for septic system repairs and replacement, or sanitary sewers within Worth Township to prevent raw sewage discharges. Additionally, many old seasonal dwellings are now becoming year round residences increasing the probability of overloading existing on-site treatment systems.

Replacement and/or modification to failing septic systems in Worth Township have been historically documented by the Sanilac County Health Department. In a March 9, 2001, transmittal to the township, the Sanilac County Health Department clearly outlined the need to address problems related to on site sewage disposal systems for dwellings in the subdivisions along M-25, and recommended the township to "proceed aggressively to install a municipal sewage system". In a further correspondence with the township dated July 27, 2001, the Sanilac County Health Department provided additional information related to failing septic systems in this same area. Copies of these letters and supporting documentation of septic system failures and denials in this area are attached.

Raw or inadequately treated sewage discharges from the individual (commercial and/ or residential) septic systems may be occurring from either direct pipes, field tiles, or failed

tile fields. Raw or inadequately treated sewage poses an unacceptable risk to the public health by increasing risks of water borne disease transmission, and the discharge of any raw sewage of human origin, directly or indirectly, into any of the waters of the state is considered prima facie evidence and constitutes a public nuisance. The E. coli, and Fecal Coliform counts found in this survey are indications that human enteric pathogens (bacteria, phages, cysts, and viruses) are likely present in the receiving waters. Worth Township does not have a permit to discharge sanitary wastewaters to surface waters of the State. These survey data indicate that the Rule 62, microorganism water quality standards, promulgated under the Act, may be routinely violated.

Survey conducted by: Charles Bauer, Gene Suuppi, and Tom Young
Environmental Quality Analysts
Michigan Department of Environmental Quality

Sue VanDyke
Sanilac County Health Department
Sanilac County

Report by: Charles Bauer
Environmental Quality Analyst
Michigan Department of Environmental Quality

**Table 1 Sanitary Sampling Results for Worth Twp.
Single Event Samples
(E. Coli Bacterial Counts per 100 ml)
May 1, 2003**

Station	Location	E. Coli Count (WQS - 300)
1	Chippewa Rd drain @ beach	780
2	bg Chippewa Rd drain u/s M-25	290
3	Cedar (Lane) Haven Creek @ beach	1610
4	Cedar Haven Creek bg d/s M-25	510
5	Roger Rd. @ beach bridge(sample pole)	720
6	Roger Rd. bg u/s or d/s M-25	660
7	Drain south of Zenith Rd @ beach	1110
8	Zenith Rd bg u/s of M-25(Ace Hdwe)	1010
9	SS outfall @ beach below Lakeview btwn Satinwood & Worth Rds.	2130
9A	SS outfall @ beach below Walbridge Rd.	530
10	SS outfall @ beach below Lakeview btwn Rosewood & Pine Roads	4000
11	SS outfall @ beach below Lakeview btwn Pine & Oak Roads	20
12	SS 16" outfall @ beach below Lakeview east of Maple Rd.	680
13	SS outfall @ beach below Lakeview east of Laurel Rd.	20
14	SS outfall @ beach below Lakeview east of Juniper Rd.	< 10
15	Mill Creek @ beach south of Woodside @ Lakeview	270
16	Mill Creek bg southeast corner of M-25 at Mill Creek	80

17	SS 12" outfall @ beach below Lakeview east of Huron Bay Blvd.	2050
Station	Location	E. Coli Count (WQS - 300)
18	SS 24" outfall @ beach below Lakeview east of Dogwood Rd.	2060
19	SS outfall @ beach below Lakeview east of Cedar Rd.	1960
20	SS outfall @ beach below Lakeview east of Birchcrest Rd.	4000
21	SS 30" beach outfall below Lakeview & east of Aspen Rd.	1720
22	Drain outfall @ beach north of Lakeview & Lakewood Rds.	1080
23	Drain bg@ Kipling & Birchcrest 2 blocks u/s or west of M-25	240
24	SS outfall @ beach below Lakeview east of Birchwood Rd.	680
25	SS outfall @ beach east of Maplewood and Lakeview Rds.	370
26	SS outfall @ beach east of Elmwood & Lakeview Rds.	400
27	Drain south of Elmwood @ beach	970
28	Drain bg u/s of M-25 @ Van Dyke Landscaping	400
29	Bluewater Blvd outfall @ beach	720
30	Drain btwn Sunset & Woodbine outfall @ beach (south end of park)	400
31	Drain btwn Sunset & Woodbine bg d/s of M-25 south of St Clair Rd	1990

NOTE:

WQS - Michigan Water Quality Standard
bg - background sample
u/s - upstream
d/s - downstream
ss - stormsewer
btwn - between

**Table 2 Sanitary Sampling Results for Worth Twp.
Single Event Samples
(Fecal Coliform Bacterial Counts per 100 ml)
May 1, 2003**

Station	Location	Fecal Coliform Count (WQS - 400)
1	Chippewa Rd drain @ beach	950
2	bg Chippewa Rd drain u/s M-25	310
3	Cedar (Lane) Haven Creek @ beach	1700
4	Cedar Haven Creek bg d/s M-25	650
5	Roger Rd. @ beach bridge(sample pole)	650
6	Roger Rd. bg u/s or d/s M-25	610
7	Drain south of Zenith Rd @ beach	900
8	Zenith Rd bg u/s of M-25(Ace Hdwe)	1300
9	SS outfall @ beach below Lakeview btwn Satinwood & Worth Rds.	1700
9A	SS outfall @ beach below Walbridge Rd.	600
10	SS outfall @ beach below Lakeview btwn Rosewood & Pine Roads	3700
11	SS outfall @ beach below Lakeview btwn Pine & Oak Roads	50
12	SS 16" outfall @ beach below Lakeview east of Maple Rd.	830
13	SS outfall @ beach below Lakeview east of Laurel Rd.	10
14	SS outfall @ beach below Lakeview east of Juniper Rd.	< 10
15	Mill Creek @ beach south of Woodside @ Lakeview	270
16	Mill Creek bg southeast corner of M-25 at Mill Creek	180

17	SS 12" outfall @ beach below Lakeview east of Huron Bay Blvd.	1900
Station	Location	Fecal Coliform Count (WQS - 400)
18	SS 24" outfall @ beach below Lakeview east of Dogwood Rd.	2400
19	SS outfall @ beach below Lakeview east of Cedar Rd.	800
20	SS outfall @ beach below Lakeview east of Birchcrest Rd.	3900
21	SS 30" beach outfall below Lakeview & east of Aspen Rd.	2000
22	Drain outfall @ beach north of Lakeview & Lakewood Rds.	1100
23	Drain bg@ Kipling & Birchcrest 2 blocks u/s or west of M-25	160
24	SS outfall @ beach below Lakeview east of Birchwood Rd.	5000
25	SS outfall @ beach east of Maplewood and Lakeview Rds.	850
26	SS outfall @ beach east of Elmwood & Lakeview Rds.	5100
27	Drain south of Elmwood @ beach	1500
28	Drain bg u/s of M-25 @ Van Dyke Landscaping	550
29	SS Bluewater Blvd outfall @ beach	860
30	Drain btwn Sunset & Woodbine outfall @ beach (south end of park)	1000
31	Drain btwn Sunset & Woodbine bg d/s of M-25 south of St Clair Rd	2900

NOTE:

WQS - Michigan Water Quality Standard
bg - background sample
u/s - upstream
d/s - downstream
ss - stormsewer
btwn - between

Table 3 Sanitary Sampling Results for Worth Twp. May 1, 2003
Field Data

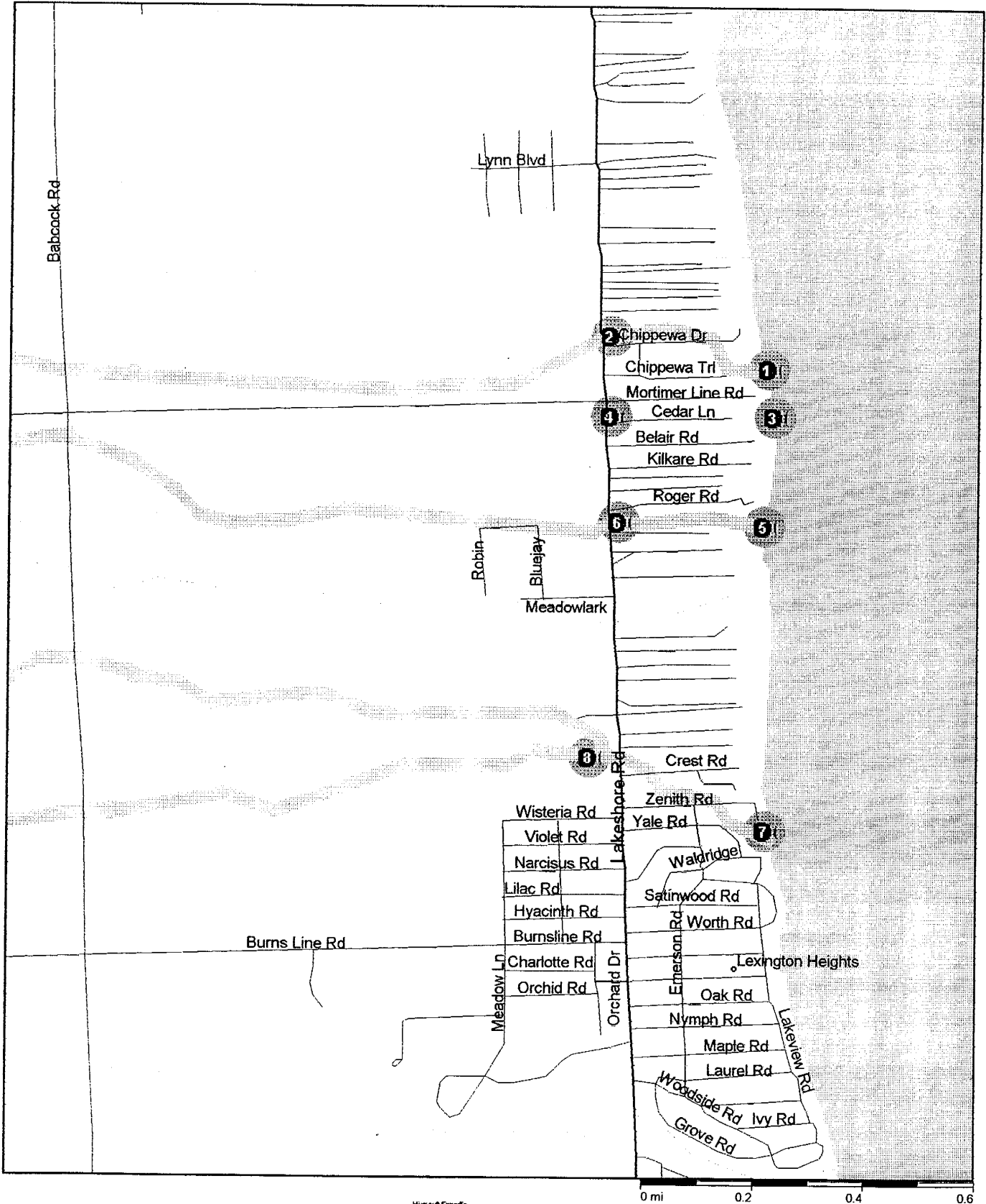
Station	Location	D.O.	pH	Temp.	Notes
1	Chippewa Rd drain @ beach	11.44	6.5	9.3	High flow
2	bg Chippewa Rd drain u/s M-25	8.13	6.5	9.1	
3	Cedar (Lane) Haven Creek @ beach	9.91	6	12.1	High flow, grey water, faint to moderate sewage odor
4	Cedar Haven Creek bg d/s M-25	8	6	13.2	Very grey (greyish-brown), oily sheen, picture taken
5	Roger Rd. @ beach bridge(sample pole)	10.76	6	9.9	High flow
6	Roger Rd. bg u/s or d/s M-25	9.11	6.5	10	
7	Drain south of Zenith Rd @ beach	10.47	6	10.4	High flow, slight to moderate sewage odor
8	Zenith Rd bg u/s of M-25(Ace Hdwe)	9.95	6	11.1	
9	SS outfall @ beach below Lakeview btwn Satinwood & Worth Rds.				stairs east of Tulip Rd., very strong sewage odor
9A	SS outfall @ beach below Walbridge Rd.				
10	SS outfall @ beach below Lakeview btwn Rosewood & Pine Roads				stairs east of Pine Rd., very strong sewage odor
11	SS outfall @ beach below Lakeview btwn Pine & Oak Roads				stairs east of Pine Rd., tube disconnected and eroding, faint sewage odor
12	SS 16" outfall @ beach below Lakeview east of Maple Rd.				stairs @ Pine Rd., 10:40 A.M.
13	SS outfall @ beach below Lakeview east of Laurel Rd.				stairs @ Laurel Rd., slight sewage odor, 10:43 A.M.
14	SS outfall @ beach below Lakeview east of Juniper Rd.				just south of breakwall, stairs @ Laurel Rd., 10:41 A.M.
15	Mill Creek @ beach south of Woodside @ Lakeview	9.4	7	10	sample pole needed, 9:20 A.M., cloudy
16	Mill Creek bg southeast corner of M-25 at Mill Creek	8.6	7	10	9:40 A.M.
17	SS 12" outfall @ beach below Lakeview east of Huron Bay Bvd.				9:25 A.M.
18	SS 24" outfall @ beach below Lakeview east of Dogwood Rd.				Sewage odor, foam, grey water, 9:16 A.M.
19	SS outfall @ beach below Lakeview east of Cedar Rd.				cloudy, foam 9:15 A.M.
20	SS outfall @ beach below Lakeview east of Birchcrest Rd.				cloudy, slight odor, 9:12 A.M.
21	SS 30" beach outfall below Lakeview & east of Aspen Rd.				clear, slight odor, 9:08 A.M.

Station	Location	D.O.	pH	Temp.	Notes
22	Drain outfall @ beach north of Lakeview & Lakewood Rds.	10	7	9	access through park, cloudy, 9:05 A.M.
23	Drain bg@ Kipling & Birchcrest 2 blocks u/s or west of M-25	8.8	7	12	clear, 9:52 A.M.
24	SS outfall @ beach below Lakeview east of Birchwood Rd.				8:55 A.M.
25	SS outfall @ beach east of Maplewood and Lakeview Rds.				8:51 A.M.
26	SS outfall @ beach east of Elmwood & Lakeview Rds.				Clear 8:48 A.M.
27	Drain south of Elmwood @ beach	9.8	7	9	Cloudy, high TDS 8:45 A.M.
28	Drain bg u/s of M-25 @ Van Dyke Landscaping	9.2	7	9	Cloudy, high TDS 8:37 A.M.
29	SS Bluewater Blvd outfall @ beach				8:31 A.M.
30	Drain btwn Sunset & Woodbine outfall @ beach (south end of park)	10	7	10	cloudy flow with high TDS, 8:25 A.M.
31	Drain btwn Sunset & Woodbine bg d/s of M-25 south of St Clair Rd	8.4	7	9	clear, leeches, 8:18 A.M.

NOTE:

WQS - Michigan Water Quality Standard
bg - background sample
u/s - upstream
d/s - downstream
ss - stormsewer
btwn - between

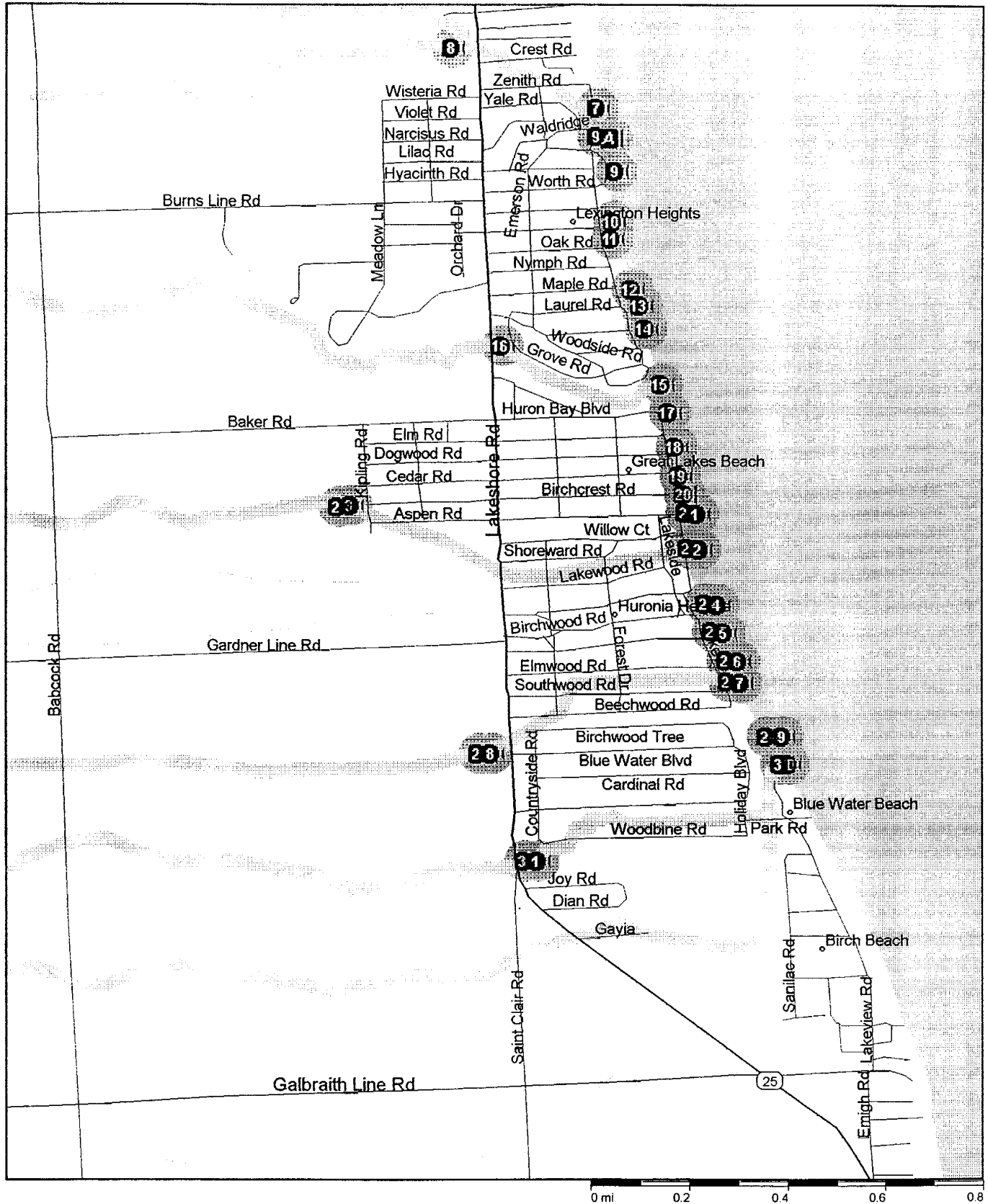
Worth Twp Survey Map 1



Microsoft Expedia

Streets98

Worth Twp Survey Map 2



Streets98

SANILAC COUNTY HEALTH DEPARTMENT

171 Dawson Street, Sandusky, Michigan 48471
Telephone: 810-648-2150 Ext.124 Fax: 810-648-2646

March 9, 2001

Janice Putz
Worth Township Supervisor

Dear Mrs. Putz,

Please be advised we are observing many problems when we evaluate on site sewage disposal systems for dwellings in the subdivisions along M-25.

Those problems include:

- 1) Sewage surfacing in yards
- 2) Sewage backups in dwellings
- 3) Sewage going onto neighbors property
- 4) Sewage draining to road ditches or surface drains

The reasons for those problems include:

- 1) Systems which are too small
- 2) Systems which are very old
- 3) People converting seasonal cottages into year round homes
- 4) People using more water
- 5) Poor soil and drainage conditions for sewage disposal systems
- * 6) Property which is too small for an on-site sewage disposal system

Our department therefore recommends the township take the following action:

- 1) Proceed aggressively to install a municipal sewage system.
- * 2) In the meantime limit remodeling of existing dwellings to simple repairs.

Enclosed is a copy of a newspaper article from 10 years ago which illustrates the problems are not new. However, the magnitude of the problem grows worse every year. The lack of a municipal sewer system in the area is causing a hardship for the residents and impossible situations for our department. Hopefully you can use this letter along with other information I am enclosing to apply for grants that are available. If you have any questions or need assistance please contact Grant Carman, Judy Ferguson, or myself.

Sincerely,



Richard Gonnering
Sanitarian

cc. Judy Ferguson Health Officer Sanilac County Health Department
Sanilac County Board of Health
James Young Sanilac County Board of Commissioners
Andy Fabian Sanilac County Board Of Commissioners
James Young Sanilac County Prosecuting Attorney
Steve Ehardt Representative State of Michigan
Worth Township Clerk

SANILAC COUNTY HEALTH DEPARTMENT

171 Dawson Street, Sandusky, Michigan 48471
Telephone: 810-648-2150 Ext.124 Fax: 810-648-2646

July 27, 2001

Janice Putz
Worth Township Supervisor

Re: Sewage Problems along M-25 and adjacent property

Dear Mrs. Putz,

Based on our experience and as a follow up to my other correspondence (copies enclosed) the following should be useful in applying for and obtaining grants to install a municipal sewer system.

- 1) A restaurant owner has a failed sewage system which is estimated will cost \$40,000.00 to correct. However, there is no guarantee of acceptable performance as the property is too small for a properly sized system and they produce a large volume of sewage. Not having a municipal sewer could put them and others having similar problems out of business.
- 2) Township building projects such as expanding the township hall and building an office for the water department have soil and space constraints that limit options.
- 3) Many residential and commercial structures can not be built or added to because the lots do not meet minimum sewage disposal guidelines. This adversely affects tax base, jobs, the local economy and aesthetic improvements to the community.
- 4) Pump and haul is too expensive for most people to afford and cannot be realistically monitored by us or the township for compliance.
- 5) Numerous failed soil absorption systems exist for which there is no answer except a municipal sewer system. There are "relief" drain pipes to ditches, surfacing of contaminated water and similar problems, especially during wet weather, are a risk and health hazard.
- 6) A proposed new state law which has passed the state senate requires inspection and approval of on-site sewage facilities prior to rental or selling of a dwelling. Inadequate sewage facilities could virtually stop most real estate transactions.
- 7) Installation of minimal on-site replacement sewage systems at existing dwellings is often futile and a waste of money which could be spent on a municipal sewer system.

Worth Township Documentation

Address: 7384 Chippewa Drive *Section:* 6 *Date:* 6-25-02

Sewage system: Failed to ground surface; ponded in yard with minimal weekend use.

Remarks: Homeowner requested assistance with problem of sewage ponding in the yard of their vacation home. Home is located on small lot on lake bluff. Replacement system installed though due to lot constrictions, lower and smaller than code requirements. Existing water well was abandoned to make room for septic; home is connected to municipal water.

Address: 7363 Satinwood *Section:* 7 *Date:* 6-25-02

Sewage system: Complaint filed by neighbor concerning sewage flowing onto his lot. System was flooded, ponded over tank, small amount flowing to the east.

Remarks: Replacement system built in front yard, lower and smaller than code requirements due to lot restrictions. Road commission then decided that system was into road right of way, and required that southernmost trench be removed. Owner shored up the mound with a retaining wall, but sewage continues to perk through wall toward road.

Address: 7289 Cedar St. *Section:* 13 *Date:* 10-13-99

Sewage system: Relief pipe connecting sewage system to ditch.

Remarks: Two letters to owner notifying that pipes must be removed; sewage pumped and hauled away. Property was in change of ownership which apparently fell through after sewage problem discovered. No notation that problem was ever resolved.

Address: 7169 Cedar St. *Section:* 13 *Date:* 12-11-92

Sewage system: Drains into roadside ditch.

Remarks: Documentation on permit for replacement system indicates sewage flowing into ditch on both sides of the driveway, and that problem had not been resolved as of 5-9-02.

Address: 7508 Cedar St. *Section:* 13 *Date:* 4-18-00

Sewage system: unknown.

Remarks: Letter from SCHD to realtor advising that neighborhood surrounding this address has failed sewage systems and sewage in the roadside ditches.

Address: Cedar St. *Section:* 13 *Date:* 5-1-01

Sewage system: unknown

Remarks: Letter from Worth Twp. to SCHD about sewage in ditches east and west of Cedar, asking that any homes discharging sewage into ditches be condemned by SCHD.

Address: 7208 Dogwood St. *Section:* 18 *Date:* 10-17-00

Sewage system: 80 ft. block drain failed to ground surface and running into ditch.

Remarks: Original complaint from someone in neighborhood, followed up by site visits and order letters to correct problem. Homeowner has not complied.

Address: 7265 Cedar St. *Section:* 18 *Date:* 9-30-97

Sewage system: unknown.

Remarks: Rental house with sewage flowing across yard into neighbor's yard. Correspondence with landowner advising that a holding tank would probably be needed, landowner indicated that water conservation methods would be employed.

Address: 7126 Lakeview, 7390 Laurel *Section:* 18 *Date:* 7-24-00

Sewage system: Existing shared system had direct discharge of raw sewage to roadside drain and then over the lake bluff.

Remarks: Small replacement system installed; complete with pump. System not as big as would be required by code, lot is too small. Tile drain installed to route surface water past the lot to help alleviate problems.

Address: 7301 Birchcrest *Section:* 18 *Date:* 5-15-00

Sewage system: unknown.

Remarks: Rental property. In the spring, the yard is saturated and covers septic tank. Sewage surfaces in the north yard. Letter from SCHD to realtors indicating that a raised sand mound is needed, and that many homes nearby have sewage systems which discharge into the road side ditch.

Address: 7337 Birchwood *Section:* 18 *Date:* 5-7-01

Sewage system: unknown.

Remarks: Correspondence about sale of property with sewage system too close to well, possible contamination. Site evaluation done, no indication that replacement system was installed.

Address: 7428 Woodland *Section:* 18 *Date:* 6-7-01

Sewage system: unknown.

Remarks: Documentation of continuing problem of sewage flowing into ditch. Owners were advised problem must be corrected and given application to fill out, but they did not respond. Forwarded to prosecuting attorney, no action taken by that office.

Address: 7504 Birchcrest *Date:* 11-28-00

Remarks: Denial for a new dwelling after meeting with owner at 7498 Birchcrest. Lot is not big enough; soils listed as silty, water saturation level at 20" on 11-27-00.

Address: 7535 Elmwood *Date:* 5-28-99

Remarks: Note about conversion of cottage to year round home, indicating problems with well isolation and clay soils.

Address: 7296 Cedar *Date:* 8-16-96

Remarks: application for permit to remodel denied. Previous documentation shows a small system for weekend cottage. Home has since been expanded to almost twice the size without approval.

Address: 7295 Cedar *Date:* 4-11-00

Remarks: Note to owner of home that was being remodeled. The original system was installed in 1962. Owner was advised that it would not support increased use. Home was later sold without full disclosure to the buyer.

Address: 7307 Byron *Date:* 11-5-99

Remarks: Denial of application to replace existing cottage with new home. Lot too small; indication of sewage in ditch near culvert.

Address: 6841 Lakeshore *Date:* 4-13-99

Remarks: Denial of application to replace dwelling. Noted that township allowed new structure to be built anyway in 2001.

Address: Next to 7360 Elm *Date:* 5-13-99

Remarks: Denial of application to build on vacant lots. Soil saturated at or near surface, lot too small.

Address: between 7321 and 7294 Woodside

Remarks: Denial of application for building on vacant land. The lot has a deep gully and a sharp drop off, and does not have enough room for buildings.

Address: 7503 Dogwood *Date:* 3-22-02

Remarks: Denial of application for addition to building. Lot too small.

Appendix 4 - National Pollutant Discharge Elimination System Permitted Discharges

Permittee	NPDES Number	Discharge Parameter
Huron Incorporated 6554 Lakeshore Road Lexington, MI 48450	MI0002429	Temperature Oxygen PH Solids Nitrogen Phosphorus Chlorine Coliform Biochemical Oxygen Demand Xylene
Sandpiper Estates WWSL 6049 Lakeshore Road Lexington, MI 48450	MIG580363	Oxygen Biochemical Oxygen Demand PH Solids Nitrogen Phosphorus Coliform
Village of Lexington WTP 7200 Lester Street Lexington, MI 48450	MIG640220	No Data
Village of Lexington WWSL	MIG580356	Oxygen Biochemical Oxygen Demand PH Solids Nitrogen Phosphorus Coliform
Huron Shores Estates WWSL 144 Shoreline Drive Port Sanilac, MI 48469	MI0025445	Oxygen Biochemical Oxygen Demand PH Solids Nitrogen Phosphorus Chlorine Coliform
Village of Forestville WWSL Potts Road Forestville, MI 48434	MIG580076	Oxygen Biochemical Oxygen Demand PH Solids Nitrogen Phosphorus Coliform

Appendix 4 - National Pollutant Discharge Elimination System Permitted Discharges

Permittee	NPDES Number	Discharge Parameter
Minden City WWSL 5th Street Minden City, MI 48456	MIG580298	Oxygen Biochemical Oxygen Demand PH Solids Nitrogen Phosphorus Coliform
Albrecht Investment Company 7511 Big Gully Road Forestville, MI 48434	MIG490255	PH Solid

Appendix 5 - Nonpoint Source Pollution Sites

TRASH AND DEBRIS

SITE ID	NAME	ADJACENT LAND USE (LEFT BANK)	ADJACENT LAND USE (RIGHT BANK)	LENGTH OF DEBRIS (FT)	AMOUNT OF DEBRIS	DIVERTING STREAM FLOW	COMMENTS
131WOR2701	BIRTCR CREEK	WOODLAND	WOODLAND	5	SLIGHT	NO	CAR HOOD & OTHER METAL IN THE STREAM
131WOR2704	BIRTCR CREEK	WOODLAND	WOODLAND	20	EXTENSIVE	NO	OLD REFRIGERATORS & APPLIANCES PUSHED INTO BANK & LOTS OF JUNK INTO CREEK
131WOR3102	BIRTCR CREEK	IDLE	IDLE	20	EXTENSIVE	YES	BEAVER DAM
131WOR3401	BIRTCR CREEK	WOODLAND	WOODLAND	20	MODERATE	YES	
131WOR3501	BIRTCR CREEK	WOODLAND	WOODLAND		MODERATE	YES	
172WOR2302	172	AGRICULTURAL	AGRICULTURAL		EXTENSIVE	NO	CARS & OTHER JUNK IN WOODS
177LEX2701	MILL CREEK	AGRICULTURAL	AGRICULTURAL	50	EXTENSIVE	NO	LOT OF FALLEN DEBRIS IN CREEK
177WOR0303	MILL CREEK	AGRICULTURAL	AGRICULTURAL	50	MODERATE	YES	LARGE FALLEN TREE CAUSING WATER TO DIVERT & WASHING OUT BANK
177WOR1404	MILL CREEK	WETLAND	WETLAND	20	EXTENSIVE	YES	BIG TREE FALLEN ACROSS CREEK
230SAN2605	230				SLIGHT		BATTERY
242SAN1402	242	WOODLAND	WOODLAND	15	EXTENSIVE	YES	
242SAN2001	242	AGRICULTURAL	AGRICULTURAL		SLIGHT	NO	JUNK IN STREAM
247SAN1501	MCKENZIE CREEK	AGRICULTURAL	AGRICULTURAL	6	EXTENSIVE	YES	
253SAN0401	253	AGRICULTURAL	AGRICULTURAL				LARGE TRASH PILE
253SAN0702	253	AGRICULTURAL	RES/COMM	10	SLIGHT	NO	PIC DISK 9 GARBAGE / TIN CANS
256SAN3202	LIENS CREEK				EXTENSIVE	YES	SEE ARIAL PHOTO
256SAN3301	LIENS CREEK	WOODLAND	WOODLAND		EXTENSIVE		HOUSEHOLD GARBAGE SEE ARIAL PHOTO
272SAN2101	MILLER CREEK	WETLAND	WETLAND				
280FOR1502	SHERMAN CREEK	WOODLAND	WOODLAND	20	EXTENSIVE	YES	ABOUT 75' OF CREEK PLUGGED BY TREES
280FOR1602	SHERMAN CREEK	WETLAND	WETLAND	10	SLIGHT	YES	
296FOR3201	CHERRY CREEK	WETLAND	RES/COMM	10	MODERATE	YES	CAR TIRES IN STREAM
314FOR3003	BIG CREEK	IDLE	IDLE	15	MODERATE		
360DEL2501	MARTELL CREEK	AGRICULTURAL	AGRICULTURAL	15	MODERATE	NO	OLD PAINT CANS & OLD CAR CAB ON BANK
390DEL0102	COUNTY LINE CREEK	AGRICULTURAL	AGRICULTURAL	1000	EXTENSIVE	YES	VERY LARGE AMOUNT OF TRASH, OLD MACHINERY, CARS ANYTHING YOU CAN IMAGINE

**Eastern Sanilac Coastal Tributary Watersheds
Policy Committee**

POLICY REVIEW DOCUMENT SUMMARY

BACKGROUND

Nonpoint source (NPS) pollution has been identified by the United States Environmental Protection Agency as the leading cause of water use impairments. The Clean Water Act of 1987 included control of NPS pollution in the National Pollutant Discharge Elimination System (NPDES) Storm Water Regulations. Phase II of the NPDES Storm Water Regulations has identified areas within the Eastern Sanilac Coastal Tributary Watersheds (Watershed) as urbanized areas required to obtain a permit to discharge storm water runoff.

Storm water is essentially rainwater that has intercepted an impervious surface. Storm water is then transported over the land through drainage ditches, storm sewers, roadways, and parking lots. Along the way, the runoff can pick up pollutants, like heavy metals, sediment, fertilizers, and pesticides. Urbanized areas must discover methods to control storm water pollution to maintain compliance with their NPDES Storm Water Discharge Permit.

The NPDES regulated governments are not the only communities that benefit from reducing storm water runoff pollution. The coastal communities in the Watershed understand the economic benefits of healthy and enjoyable water resources. Developers and homeowners pay a premium to own waterfront property. However, water resources that become polluted or unusable will lose economic and recreational value.

The greater part of NPS pollution control has been left to local governments. At the local level, governments have control over land use activities and development. It is at this local level that NPS pollution can be controlled most effectively. However, without the proper authority granted through ordinances, very little control over storm water pollution can be accomplished. Therefore, the purpose of the Policy Review Document is to identify opportunities for local governments to modify their existing policies to improve water quality.

METHODS

Ordinances and master plans for the Watershed's communities were analyzed for their effectiveness at protecting water resources. Using the South Eastern Michigan Council of Governments' Workbook for Local Governments, entitled **Opportunities for Water Resource Protection in Local Plans, Ordinances, and Programs**, each community's ordinances and master plans were assessed using a common baseline. This baseline included analysis of storm water management, land conservation and coastal zone development, soil erosion and sedimentation control, sewer infrastructure planning, pollution prevention, public education, and impervious surface reduction. The workbook is designed to provide guidance on the opportunities available in local plans, ordinances, and programs to protect water resources. The primary goals for the workbook are to demonstrate the connections between plans and ordinances for communities faced with Phase II Storm Water Regulation compliance, to illustrate the connection between land use and storm water pollution, and to link protection of resources with citizen health, safety, and welfare.

PRELIMINARY OBSERVATIONS

Land Use Trends

Similar to all areas in Michigan, the rate of land development in the Watershed is outpacing the rate of population growth. This is due to the shrinking number of family members per household and the reliance on traditional spatial land use zoning. Traditional zoning places different land uses far apart, resulting in greater driving distances to commercial centers and the work place. Township and County Master Plans have recognized this trend and have recommended that future development be adjacent to already developed parcels. This would lead to rapid development of the coastal townships. Traditional zoning for rural townships is typically not sufficient to handle intense development pressures.

Recommendations

- ? Encourage conservation design and cluster development with density bonuses.
- ? Create a coastal overlay district.
- ? Identify unique environmental areas and state reason for protection in the Master Plan. Include all applicable maps in the Master Plan.
- ? Create a land division ordinance for coastal zones.

Site Plan Review

The need for professional review of site plans is becoming increasingly necessary. Most townships do not have full time staff qualified to make educated judgments about storm water management, transportation needs, and land capability. It is best to rely on a professional that can be held accountable for such decisions. These fees can be assessed to the individual requesting the site plan review. With professional review of site plans, design standards can be created. The design standards can create requirements that are in line with goals outlined in the Master Plan, such as onsite storm water treatment and open space preservation. This will allow communities to make full use of the benefits that are available by using planned unit developments (PUDs).

Recommendations

- ? Create an escrow account to accept professional review fees.
- ? Hire local engineer to perform site plan reviews.
- ? Work with planner and developers to develop design standards for storm water management, septic field placement or onsite sewage treatment, density bonus for conservation design, and coastal zone setbacks.

Master Plans

The Master Plan provides the legal basis for zoning. The requirement of a Master Plan is stated in the Michigan planning laws. This fact is often overlooked, resulting in loss of litigation protection if ordinances are questioned in court. Not only are Master Plans required, but strict and rigid adherence to the plan also provides legal protection, since the burden of proof lies on the planning commission in all suits brought against the elected body.

The Master Plan should identify the current and future goals of the planning commission. These goals should include community desires for protection of resources, capital expenditures, public services, and future land uses. All geographic goals for protection or development should be clearly mapped to eliminate confusion should conflict arise. Any ordinances should support the goals outlined in the Master Plan.

Recommendations

- ? Provide easy access to current master plans and ordinances.
- ? Ensure that township and village clerks have electronic and print copies of the complete collection of ordinances and the Master Plan.
- ? Document all decisions and the reasoning behind them at all planning commission meetings.
- ? All documents must be on file with the County Planning Commission if the township or municipality does not have a local planning commission.
- ? Update the Master Plan every 5 years.
- ? Review Master Plan and identify areas that are not supported by ordinances.
- ? Conduct a community survey and natural features inventory.
- ? Include a copy of the Policy Review Document and Watershed Management Plan as an appendix in the Master Plan.
- ? Update current land use maps.
- ? Conduct a community audit with a build-out map.
- ? Clearly identify conservation goals and show conservation areas on maps.
- ? Remain committed to Master Plan and do not allow special circumstances without providing written documentation of why a variance was granted.
- ? Work closely with planners to ensure that they fully understand the goals of the community.
- ? Educate the planning commission to ensure that they are able to successfully communicate with the planners.

Model Ordinances

Model ordinances have become readily available through the Michigan Township Association, Michigan Municipal League, the Michigan Society of Planners, and various internet resources. After creating the Master Plan review, the planning commission should look for model ordinances that support their goals and make recommendations to the elected body to adopt or change these ordinances. A preliminary list of recommended model ordinances that are available on-line or through a planning organization is listed below.

Recommendations

- ? Storm water ordinance with impervious surface reduction bonuses.
- ? Overlay districts in coastal zones.
- ? Surface water setback requirements.
- ? Appearance codes for coastal zones.
- ? Conservation subdivision design standards.
- ? PUD design standards.
- ? Open space conservation.
- ? Farmland preservation.
- ? Urban growth boundaries.
- ? Filter strip design standards and buffer requirements.
- ? Floodplain and high risk erosion area development restriction.
- ? Illicit discharge elimination and inspection authority.

On the Web

- ? American Planning Association - www.planning.org
- ? Storm water resources from the Center for Watershed Protection - www.stormwatercenter.net
- ? Michigan State University Extension Natural Features Inventory - web4.msue.msu.edu/mnfi
- ? Michigan Society of Planning - www.planningmi.org
- ? Michigan Townships Association - www.michigantownships.org
- ? Survey of community desires for new developments - www.whatmichiganwants.com
- ? Planning guide for small communities - www.epa.gov/ORD/NRMRL/Pubs/1994/625R94009.pdf

Domestic Geographic Name Report

1. Use this form to recommend a feature name or to suggest a name change.

2. For features on Federal lands, coordinate requests with the agency (U.S. Forest Service, National Park Service, Bureau of Land Management, etc.) for the administrative area in which the feature is located.

3. On the reverse side of this form give information on the local usage and authority for recommended name.

4. For more information about the Geographic Names Information System or the National Gazetteer program, contact the U.S. Board on Geographic Names at 703-648-4544.

5. Return this form to:

Executive Secretary for Domestic
Geographic Names
U.S. Geological Survey
523 National Center
Reston, VA 20192

Action Requested:	Recommended Name
Proposed New Name	State
Application Change	County or Equivalent
Name Change	Administrative Area
Other	

Specific Area Covered:

Latitude: ____° ____' ____" N S Longitude: ____° ____' ____" W E Mouth End Center
Latitude: ____° ____' ____" N S Longitude: ____° ____' ____" W E Heading End
Section(s) ____ Township(s) ____ Range(s) ____ Meridian ____ Elevation ____ ft./m.

Type of Feature (stream, mountain, populated place, etc.): _____

Is the feature identified (including other names) in the Geographic Names Information System (GNIS)?

Yes No Unknown If yes, please indicate how it is listed: _____

Description of Feature (physical shape, length, width, direction of flow, etc.): _____

Maps and Other Sources Using <u>Recommended</u> Name (include scale and date)	Other Names (variants)	Maps and Other Sources Using Other Name or Applications (include scale and date)

Name Information (such as origin, meaning of the recommended name, historical significance, biographical data (if commemorative), nature of usage or application, or any other pertinent information):

Is the recommended name in local usage? Yes No If yes, for approximately how many years? _____

Is there local opposition to, or conflict, with the recommended name? Yes No (If yes, explain)

For proposed new name, please provide evidence that feature is unnamed:

Additional information:

Copy Submitted By (name):	Title	Telephone (day)	Date
Company or Agency	Address (City, State, and ZIPCode)		
Copy Prepared By (if other than above):	Title	Phone (day)	Date
Company or Agency	Address (City, State, and ZIPCode)		

Authority for Recommended Name	Mailing Address and Telephone	Occupation	Years in Area

600.0406 Paired watersheds

Paired watersheds have been used for over 40 years to evaluate the effects of silvicultural practices on watershed quantity and quality (Wilm 1949). The basic approach requires a minimum of two watersheds and two periods of study. The two watersheds are called control and treatment; the two periods of study are referred to as calibration and treatment (fig. 4-4). The control watershed serves as a check over year-to-year or seasonal climate variations and receives no changes in management practices during the study.

During the calibration period, the two watersheds are treated identically and paired water quality data are collected. Such paired data could be annual means or totals, or for shortened studies, the observations could be seasonal, monthly, weekly, or event-based.

During the treatment period, one randomly selected watershed is treated with a practice while the control watershed remains in the original management. The reverse of this schedule is possible for certain practices. Both watersheds might already be treated with a conservation practice during the calibration period. During the treatment period, one of the watersheds could be treated with a traditional practice.

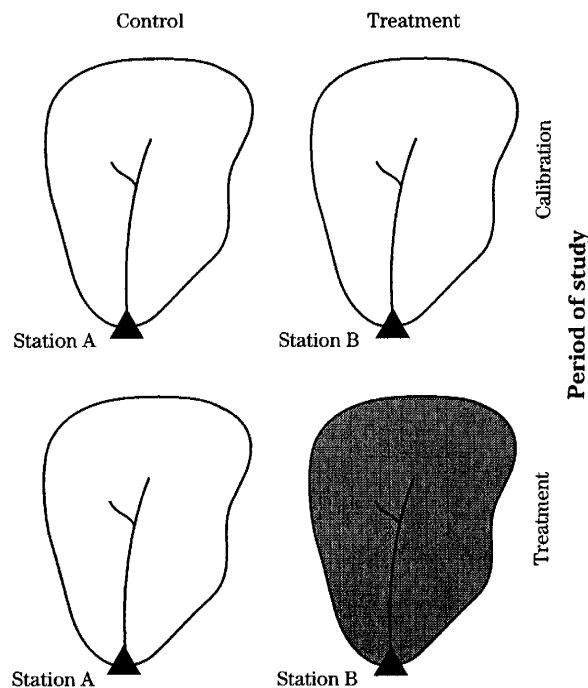
For ground water monitoring, an above-and-below approach to the paired watershed design is recommended. During the calibration period, monitoring would take place upgradient and downgradient for both the control and treatment portions of the ground water formation being studied. During the treatment period, one of the areas bounded by wells would receive a practice, while the other control area would remain as before.

Guidelines for paired watershed studies include:

- **Steady-state**—The control watershed should be at or near a steady-state condition during the life of the study (Reinhart 1967). Steady-state is used here to mean that there are no gradual changes that would result in a trend in water quality. For example, a watershed that had a gradual shift in crop types would not make a good control.

- **Size**—The watersheds should be small enough to obtain a uniform treatment over the entire area (Reinhart 1967). The size will vary depending on climatic region. In humid areas the watersheds generally would be less than 5 square miles in area. In arid climates, they could be larger.
- **Range**—The calibration period should encompass the full range of observations expected (Reinhart 1967, Wilm 1949). Normally, this refers to wet and drought years. This allows reasonable comparison of treatment data to calibration data.
- **Calibration length**—The calibration period should be long enough to develop significant regression relationships between the two watersheds so that data for the treatment watershed can be predicted knowing data from the control watershed within certain error limits (Striffler 1965). Methods for determining the length of calibration are described in part 2.
- **Response**—The designed treatment should be expected to have a large enough response to exceed prediction errors. At least a 10 percent change in the variable of interest is suggested (Hewlett & Pienaar 1973).

Figure 4-4 Paired watershed design



- **Watershed similarity**—The watersheds should be similar in size, slope, location, soils, and land cover (Hewlett 1971, Striffler 1965). They should also have been in the same land cover for a number of years before the study (Hewlett 1971). Chemical characteristics of the soils should be similar. However, no two watersheds are identical, nor can they be considered representative.
- **Monitoring suitability**—Each watershed should have a stable channel, a stable control section for monitoring, and should not leak around the gaging station at the watershed outlet (Reinhart 1967).

(a) Advantages

The greatest advantage of the paired watershed approach is that variation not associated with the treatment, such as climate differences over years, are statistically controlled (Kovner & Evans 1954). Also, the control watershed eliminates the need to measure and understand all the mechanisms generating the response (Hewlett & Pienaar 1973). The water quality of runoff from the two watersheds need not be identical. Finally, the calibration phase can be done in reverse with the treatment period preceding the calibration period (Reinhart 1967).

(b) Disadvantages

Several disadvantages to the paired watershed approach also apply to all the study designs.

- The variances in water quality data are not likely to be equal between time periods because the treatment on one of the watersheds is often quite drastic. It is also difficult to satisfy the assumptions of normality and independence of observations. Shortened calibrations may increase the likelihood of serially correlated data (Reinhart 1967).
- The treatment effect may be gradual and not constant with time (Reinhart 1967; Hewlett & Pienaar 1973). Thus overall comparisons may mask interesting results.
- The paired watershed experiment is costly and time consuming (Hewlett & Pienaar 1973).

- Long-term changes in the soils or vegetation may occur in the control watershed. Other catastrophes, such as fires, dust storms, hurricanes, and insect infestations, could occur, which could destroy the meaning of results. This disadvantage applies to all watershed designs.

(c) Statistical approach

The basis of the paired watershed approach is that there is a quantifiable relationship between paired water quality data for the two watersheds and that this relationship will persist until a major change is made in one of the watersheds (Hewlett 1971). This does not require that the quality of runoff be the same for the two watersheds; but rather that the relationship between the water quality of the two sites, except for the influence of the treatment (practice), remains the same over time. In fact, most often the water quality is different between the two watersheds. This inherent difference between all watersheds further substantiates the need to use the paired watershed approach.

The primary statistical approach is to develop significant regression relationships between the control and treatment watersheds during both the calibration and treatment periods (see part 2). These two regression relationships are then compared for identical slopes and intercepts using analysis of covariance (Reinhart 1967). During the calibration period the significance of the regression is tested using analysis of variance for regression (Snedecor & Cochran 1980). Procedures for determining the length of the calibration period have been described by Wilm (1949), Kovner and Evans (1954), and Reinhart (1967) and are presented in part 2 of this handbook. An alternative analysis approach has been presented by Green (1979), Bernstein and Zalinski (1983), and Carpenter, et al. (1989).

600.0407 Multiple watersheds

The multiple watershed approach involves more than two watersheds (Clausen and Brooks 1983, Striffler 1965, Wicht 1967). Watersheds with the treatments already in place are selected from across the region of interest. The region could be as large as a state or as small as an individual field. Sampling of the runoff is conducted from these watersheds over a period of time.

As an example, multiple watersheds could be used as a method to assess the water quality effect of storing manure during the winter and not daily spreading as a conservation practice. About 15 watersheds in each treatment could be selected. That is, 15 fields or watersheds where daily spreading was occurring during the winter, and 15 fields where no spreading occurred. During runoff periods, these fields could be sampled for the concentrations of appropriate pollutants, such as nitrogen and phosphorus.

Another example could be a test of irrigation water management. Runoff from fields in flood irrigation could be compared to runoff from sprinkler irrigated fields.

(a) Advantages

The greatest advantage of the multiple watershed approach is that the results are transferable to the region included in the monitoring. A second major advantage is that the true variability among watersheds is included in the variance for each treatment.

(b) Disadvantages

The multiple watershed approach is difficult to conduct using intermittent streams or field runoff because sampling must be timed with stormflow periods. Also, mass calculations would only be point estimates, and annual mass calculations would be expensive to obtain using a large number of watersheds. However, the probability approach has been used to determine annual mass estimates, which could reduce the number of samples that need to be collected (Richards 1989).

(c) Statistical approach

The basic statistical approach is the comparison of the means of two populations using the t-test. The testing would be for unpaired samples that may be of unequal sizes.

Subpart 615.09 Paired Watersheds

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615.0900 Introduction

The purpose of this subpart is to describe data analysis for the paired watershed design for conducting nonpoint source (NPS) water quality studies. The monitoring system design requires a minimum of two watersheds—control and treatment—and two periods of study—calibration and treatment (Green 1979, Hewlett 1971, Hewlett and Pienaar 1973, Ponce 1980, Reinhart 1967).

The control watershed accounts for year-to-year or seasonal climate variations. The management practices within the control watershed remain the same during the study. The treatment watershed has a change in management at some point during the study. During the calibration period, the two watersheds are treated identically, and paired water quality data are collected (table 09-1). Such paired data could be annual means or totals, or for shorter studies (<5 yr), the observations could be seasonal, monthly, weekly, or event-based (Reinhart 1967). During the treatment period, one watershed is treated with a best management practice (BMP) while the control watershed remains in the original management (table 09-1). The treated watershed should be selected randomly by such means as a coin toss.

The reverse of this schedule is possible for certain BMPs; the treatment period could precede the calibration period (Reinhart 1967). For example, the study could begin with two watersheds in two different treatments, such as **BMP** and **no BMP**. Later both watersheds could be managed identically to calibrate

them. Since no calibration exists before the treatment occurs, this reversed design is considered risky because you will not find out if the watersheds are properly calibrated until the end of the study.

The basis of the paired watershed approach is that

- The relationship between paired water quality data for the two watersheds is quantifiable.
- This relationship is valid until a major change is made in one of the watersheds (Hewlett 1971). At that time, a new relationship will exist.

This basis does not require that the quality of runoff be statistically the same for the two watersheds. It does require that the relationship between paired observations of water quality remains the same over time except for the influence of the BMP. Often, in fact, the analysis of paired observations indicates that the water quality is different between the paired watersheds. This difference further substantiates the need to use a paired watershed approach. This is because the technique does not assume that the two watersheds are the same; it does assume that the two watersheds respond in a predictable manner together. Example 09-1 illustrates a paired watershed analysis.

Table 09-1 Schedule of BMP implementation

Period	----- Watershed -----	
	control	treated
Calibration	no BMP	no BMP
Treatment	no BMP	BMP

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The purpose of this subpart is to describe data analysis for the paired watershed design for conducting nonpoint source (NPS) water quality studies. The monitoring system design requires a minimum of two watersheds—control and treatment—and two periods of study—calibration and treatment (Green 1979, Hewlett 1971, Hewlett and Pienaar 1973, Ponce 1980, Reinhart 1967).

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Table 09-1 Schedule of BMP implementation

Period	----- Watershed -----	
	control	treated
Calibration	no BMP	no BMP
Treatment	no BMP	BMP

615.0901 Calibration

The relationship between watersheds during the calibration period is described by a simple linear regression equation (fig. 09-1) between the paired observations, taking the form:

$$\text{treated} = b_0 + b_1(\text{control}_i) + e \quad [09-1]$$

where:

treated and control = flow, water quality concentration, or mass values for the appropriate watershed

b_0 and b_1 = regression coefficients representing the regression intercept and slope, respectively

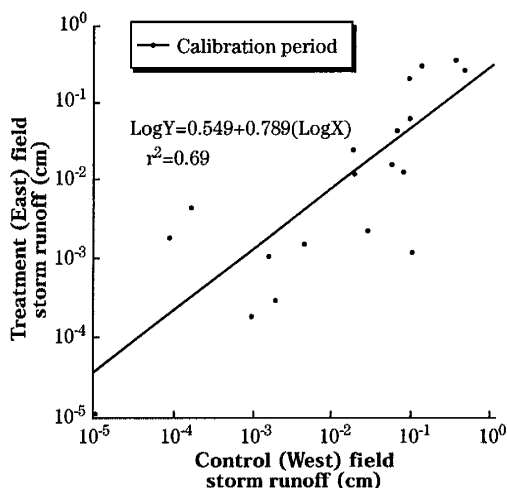
e = residual error

Three important questions must be answered before shifting from the calibration period to the treatment period:

- Is there a significant relationship between the paired watersheds for all parameters of interest?
- Has the calibration period continued for a sufficient length of time?
- Are the residual errors about the regression smaller than the expected BMP effect?

In addition, the observations should cover the full range of observations expected during treatment.

Figure 09-1 Calibration period regression



(a) Regression significance

The significance of the relationship between paired observations is tested using analysis of variance (ANOVA). The test assumes that the regression residuals are normally distributed, have equal variances between treatments, and are independent.

Hand calculations to test for the significance of the relationship are shown in Snedecor and Cochran (1980, p. 157) and in table 09-2. The values for the table are calculated from:

$$S_y^2 = \sum Y_i^2 - \frac{(\sum Y_i)^2}{n} \quad [09-2]$$

$$S_x^2 = \sum X_i^2 - \frac{(\sum X_i)^2}{n} \quad [09-3]$$

$$S_{xy} = \sum X_i Y_i - \frac{(\sum X_i)(\sum Y_i)}{n} \quad [09-4]$$

$$S_{yx}^2 = \frac{S_y^2 - \frac{(S_{xy})^2}{S_x^2}}{n-2} \quad [09-5]$$

Table 09-2 Analysis of variance for linear regression

Source	Degrees of freedom	Sum of squares	Mean squares	F
regression	1	$\frac{(S_{xy})^2}{S_x^2}$	$\frac{(S_{xy})^2}{S_x^2}$	$\left[\frac{(S_{xy}^2)}{S_x^2 S_{yx}^2} \right]$
residual	n-2	$S_y^2 - \frac{(S_{xy})^2}{S_x^2}$	S_{yx}^2	
total	n-1	S_y^2		

Also, the regression coefficients and coefficient of determination are determined from:

$$b_1 = \frac{S_{xy}}{S_x^2} \quad [09-6]$$

$$b_0 = \bar{Y} - b_1 \bar{X} \quad [09-7]$$

$$r^2 = \frac{(S_{xy})^2}{S_x^2 S_y^2} \quad [09-8]$$

To perform the calculations by hand, initially calculate:

$$\sum X_i, \sum Y_i, \sum X_i Y_i, \sum X_i^2, \sum Y_i^2, \bar{X}, \bar{Y}$$

The mean squares (MS) are determined by dividing the sum of squares by the degrees of freedom (df).

Using SAS®, the appropriate program is shown as:

SAS PC Program

```
data flow;
  title 'Total Flow (cm)';
  infile 'fname.dat';
  input flow1 flow2;
  logflow1=log10(flow1);
  logflow2=log10(flow2);
  Proc reg;
    Model logflow2=logflow1
      /P CLM;
run;
```

This program was used to generate table 09-4 in example 09-1.

(b) Calibration duration

Methods for determining whether the length of the calibration period has been sufficient have been described by Wilm (1949), Kovner and Evans (1954), and Reinhart (1967). The ratio between the residual variance (mean squares, S_{yx}^2) for the regression and the smallest worthwhile difference (d) for the treatment watershed is used to determine if a sufficient sample has been taken to detect that difference, from (Kovner and Evans 1954):

$$\frac{S_{yx}^2}{d^2} = \left(\frac{n_1 n_2}{n_1 + n_2} \right) \left[\frac{1}{F(1 + F_{n_1 + n_2 - 2})} \right] \quad [09-9]$$

where:

S_{yx}^2 = estimated residual variance about the regression

d^2 = square of the smallest worthwhile difference

n_1 and n_2 = numbers of observations in the calibration and treatment periods ($n_1 = n_2$ for this calculation because n_2 is not known yet)

F = table value ($p = 0.05$) for the variance ratio at 1 and $n_1 + n_2 - 3$ df (appendix C)

The difference (d) is selected based on experience and would vary with project expectations. If the left side of the equation is greater than the right side, then the number of samples taken was not sufficient to detect the difference.

(c) Residual errors

The confidence bands for the regression equation allow determining the level of change needed to have a significant treatment effect. In other words, how far away from the calibration regression must the treatment data be to be significantly different? Confidence bands for the regression are determined from:

$$CI = \pm(t)(S_{yx}) \sqrt{\frac{1}{n} + \frac{(X_i - \bar{X})^2}{S_x^2}} \quad [09-10]$$

where:

CI = confidence interval

S_{yx} = square root of S_{yx}^2

n and S_x^2 = factors have been previously defined

t = Student's t

X_i = value at the point of comparison to compare to the mean on the regression line

Confidence limits can be generated in SAS® by adding /P CLM to the MODEL statement.

615.0902 Treatment

At the end of the treatment period the significance of the effect of the BMP is determined using analysis of covariance (ANCOVA). The analysis is actually a series of steps determining:

- significance of the treatment regression equation
- significance of the overall regression that combines the calibration and treatment period data
- difference between the slopes of the calibration and treatment regressions
- difference between the intercepts of the calibration and treatment regressions

The analysis can be computed by hand as shown in table 09-3 (Snedecor and Cochran 1980, p. 386). The summation's symbol (Σ) in table 09-3 is used to signify the addition of the column entries above it.

An example program using SAS® is shown below. This program contains both a test of the treatment regression in the PROC REG statement and a test comparing the regression lines in the PROC GLM statement.

SAS PC Program

```
Proc reg;
    model logflow2=logflow1;
run;
Proc glm;
    class period;
    model logflow2=logflow1 period
    logflow1 * period;
run;
```

Table 09-3 Analysis of covariance for comparing regression lines

Source	df	S_x^2	S_{xy}	S_y^2	b_1	df	SS	MS	F
Within calibration	n_1-1	Eq 09-3	Eq 09-4	Eq 09-2	Eq 09-6	n_1-2	$S_y^2 - \frac{(S_{xy})^2}{S_x^2}$	Eq 09-5	
Within treatment	n_2-1	Eq 09-3	Eq 09-4	Eq 09-2	Eq 09-6	n_2-2	$S_y^2 - \frac{(S_{xy})^2}{S_x^2}$	Eq 09-5	
				Pooled	Error	Σ	Σ	SS/df	
Slopes	$n_1 + n_2 - 2$	Σ	Σ	Σ	Eq 09-6	$n_1 + n_2 - 3$	$S_y^2 - \frac{(S_{xy})^2}{S_x^2}$	Eq 09-5	
			Slope difference			1	Slope SS- Error SS		MS/ Error MS
						1	Combined SS- Slope SS		MS/ Slope MS
Intercepts	$n_1 + n_2 - 1$	combined data				$n_1 + n_2 - 2$	$S_y^2 - \frac{(S_{xy})^2}{S_x^2}$		

615.0903 Nonlinear/ multiple regression

At times the effect of the treatment may be nonlinear. Examples of nonlinear treatment effects include different responses to storm size or gradual vegetation changes. Swindel and Douglass (1984) described approaches for testing nonlinear treatment effects including quadratic approaches and fitting to a gamma distribution. Multiple regression may also be used for paired watershed studies (Hibbert 1969, Snyder 1962).

Regression through the origin can be used where zero flow is expected to occur from both watersheds at approximately the same time. This would occur for adjacent, equally sized watersheds, but not for watersheds of different sizes.

615.0904 Displaying results

The most common methods for displaying the results include a bivariate plot of paired observations together with the calibration and treatment regression equations (fig. 09-2). Another useful graph is a plot of deviations ($y_{\text{observed}} - y_{\text{predicted}}$) as a function of time during the treatment. The predicted values are obtained from the calibration regression equation.

Results should be provided of mean values for each period and each watershed. The overall results caused by the treatment can be expressed as the percent change based on the mean predicted and observed values.

615.0905 References

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Example 09-1 Paired watershed analysis

Data from a study in Vermont is used to illustrate the paired watershed approach. The purpose of the study was to compare changes in field runoff as a result of conversion of conventional tillage to conservation tillage. Information included:

- West watershed was the control and was 1.46 hectares (ha) in area.
- East watershed was the treatment field and was 1.10 ha.
- Conventional tillage was moldboard plow whereas conservation tillage was a single disk harrow.
- The calibration period was 1 year during which 49 paired observations of storm runoff were made.
- The treatment period was 3 years during which 114 paired observations of runoff were made.

The assumptions were tested for ANOVA. Data were log-transformed to approach normality based upon the Shapiro-Wilks (W) statistic. The equality of variances between periods was tested using the F-test. Residual plots were examined to check for independence of errors. The statistical package SAS® was used for all analyses (SAS 1986).

The regression coefficients of paired observations are calculated by hand as follows:

$$\sum X_i = -123.403$$

$$\sum Y_i = -180.704$$

$$\sum X_i Y_i = 533.553$$

$$\sum X_i^2 = 381.713$$

$$\sum Y_i^2 = 814.847$$

$$\bar{X} = -2.518 \left(10^X = 0.003041 \text{ cm} \right)$$

$$\bar{Y} = -3.688 \left(10^Y = 0.000205 \text{ cm} \right)$$

Therefore,

$$S_y^2 = 148.441$$

$$S_{xy} = 78.463$$

$$S_x^2 = 70.933$$

$$S_{yx}^2 = 1.312$$

The resulting F statistic for this example would indicate that the regression adequately explains a significant amount ($p < 0.001$) of the variation in paired data.

For the example, S_{yx}^2 was 1.312 (from table 09-4), $n_1 = n_2$ was 49, and F was 3.94. A 10 percent change from the mean was considered a worthwhile difference; therefore,

$$d = 0.10 \times \bar{X} = 0.10 \times \log 0.003041 \text{ cm}$$

$$\frac{S_{yx}^2}{d^2} = 20.7$$

The right side of equation 09-9 equals 6. Because 20.7 is greater than 6, the number of observations was not sufficient to detect a 10 percent change in discharge. Enough samples were taken to detect a 20 percent change in discharge:

$$\frac{S^2}{d^2} = 5.2$$

Table 09-4 Analysis of variance for regression of treatment watershed runoff on control watershed runoff

Source	df	MS	F	p
model	1	86.79	66.17	0.0001
error	47	1.31		
total	48			

Example 09-1 Paired watershed analysis—Continued

To perform the calculations for determining analysis of covariance (ANCOVA) by hand, determine the following for the example treatment data:

$$\begin{aligned}\sum X_i &= -358.14 \\ \sum Y_i &= -416.05 \\ \sum X_i Y_i &= 1,408.37 \\ \sum X_i^2 &= 1,352.54 \\ \sum Y_i^2 &= 1,653.43 \\ \bar{X} &= -3.1416 \\ \bar{Y} &= -3.650 \\ n &= 114\end{aligned}$$

Therefore,

$$\begin{aligned}S_y^2 &= 135.00 \\ S_{xy} &= 101.32 \\ S_x^2 &= 227.43\end{aligned}$$

The treatment period regression was found to be significant based on the analysis of variance for regression (table 09-5).

The analysis of covariance obtained in SAS® output summarizes the significance of the overall model, compares the two regression equations, the regression intercepts, and the slopes (table 09-6). The ANCOVA indicates that the overall treatment and calibration regressions were significantly different and that the slopes and intercepts of the equations also were different. The difference in slopes is evident in figure 09-2. The slight differences in F values between the hand calculation method and the SAS® output are caused by rounding errors.

For the example, the plot of deviations indicates that for most paired observations, the observed value was less than that predicted by the calibration regression equation (fig. 09-3).

In the example, a 64 percent reduction in mean runoff was attributed to the treatment (table 09-7).

The ANCOVA is completed for the example in table 09-8.

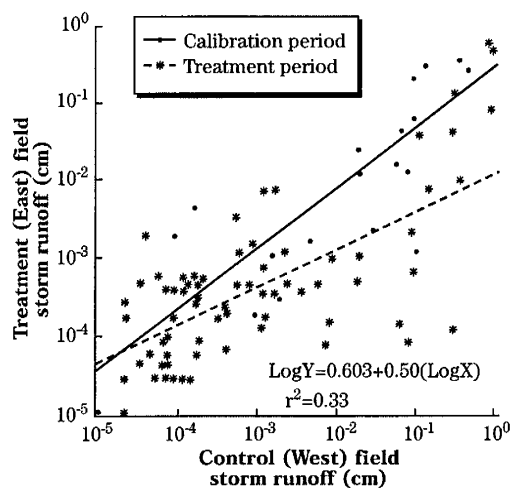
Since the slopes were found to be different, the differences in intercepts do not have any real meaning and do not need to be calculated. That is, if slopes are different, intercepts generally are different. However, the calculation for the test of intercepts is presented to show the method. The combined data are determined by summing the $\sum X_i$, $\sum Y_i$, $\sum X_i Y_i$, $\sum X_i^2$, and $\sum Y_i^2$ values for both the calibration and treatment periods and calculating new values for S_y^2 , S_{xy} , and S_x^2 . The calculation of F for the intercept uses the slope MS in the denominator. The F for the slope test uses the error MS in the denominator. A significant difference in intercepts, but not slopes indicates an overall parallel shift in the regression equation.

Table 09-5 ANOVA for regression of treatment watershed runoff on control watershed runoff for the treatment period

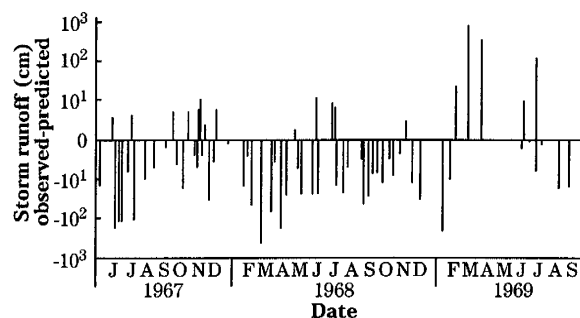
Source	df	MS	F	p
model	1	45.13	56.25	0.0001
error	112	0.80		
total	113			

Table 09-6 ANCOVA for comparing calibration and treatment regressions

Source	df	MS	F	p
model	3	43.99	46.17	0.001
error	159	0.95		
overall	1	103.09	108.18	0.0001
intercept	1	5.47	5.74	0.0178
slope	1	23.42	24.58	0.0001

Example 09-1 Paired watershed analysis—Continued**Figure 09-2** Treatment and calibration period regressions**Table 09-7** Mean values by period and watershed

Runoff (cm) x 10 ⁻²			
Calibration			
Control	0.30		
Treatment	1.63		
Treatment			
Control	0.08		
Treatment	0.04		
Predicted	0.11	-64%	

Figure 09-3 Observed deviations from predicted discharge**Table 09-8** Example analysis of covariance for comparing regression lines

Source	df	S_x^2	S_{xy}	S_y^2	b_1	df	SS	MS	F
Within calibration	48	70.933	78.463	148.441	1.106	47	61.650	1.3117	
Within treatment	113	227.430	101.315	135.000	0.445	112	89.866	0.8024	
Error						159	151.516	0.9529	
Slopes	161	298.363	179.778	283.441	0.603	160	175.116	1.0945	
Slope difference						1	23.600	23.600	24.77***
Intercepts	162	311.671	178.762	283.492		1	5.8453	5.8453	5.34*
						161	180.961		

*** indicates significance at $p=0.001$ * indicates significance at $p=0.05$

Sanilac County Planning Commission
Recommended Goals, Objectives and Possible Strategies
Approved – July 15, 2003

ECONOMY

Goal 1: Support development and promotion of initiatives that strengthen the economy of Sanilac County

Objective 1: Expand and promote tourism opportunities

Possible strategies: Use the economic development organization to provide the leadership to coordinate a countywide tourism program such as:

- a. Develop Farm Park and agricultural related sites
- b. Encourage County wide coordination of tourism and encourage chambers to work together
- c. Water activities including camping, boating & fishing
- d. Hunting
- e. Golfing
- f. Parks
- g. Historical sites including museum
- h. Fairs
- i. Entertainment
- j. Coordination of activities with overnight lodging

Objective 2: Develop and implement a plan to identify and attract *and retain* businesses that pay higher “living standard” wages

Possible strategies:

- a. Promote a positive and inviting public image of Sanilac County
- b. Attract and promote secondary educational and vocational training opportunities in Sanilac County
- c. Maintain and expand rail infrastructure for business attraction or expansion
- d. Integrate with the economic development organization business attraction plan

Objective 3: Support the business community to help improve overall availability and quality of goods and services in Sanilac County

Possible strategies:

- a. Educate the business community on workforce development programs
- b. Encourage the use of existing economic incentives and tools such as workforce training grants and Brownfield redevelopment programs.
- c. Integrate with the economic development organization business attraction plan

Goal 2: Help strengthen viability of the agricultural sector

Objective 1: Encourage education and the development of new concepts, tools and funding of economic incentives for farmland preservation

Possible new concepts:

- a. Support State and Federal legislation for farmland of 400 acres or less
- b. Purchase of development rights program
- c. Retain and support niche farming
- d. Support agricultural incubators (emerging new businesses)
- e. Support value added agricultural activities-land fill = methane greenhouse, etc

Objective 2: Encourage education and use of existing programs, tools and economic incentives

Existing programs:

- a. Encourage use of PA 116 to preserve farmland and open space
- b. Encourage use of PA 260 to keep property taxes from increasing for farmland kept in production. (These were also put under land use)

Goal 3: Help preserve rural and small town character of municipalities within Sanilac County

Objective 1: Promote use of existing programs, tools and economic incentives

Possible strategies:

- a. Support creation and funding for "Main Street" theme development projects
- b. Encourage streetscape and infrastructure improvements that enhance small town rural character
- c. Look into becoming a member of Rural Development Council of Michigan or Rural Partnership
- d. Encourage championing of small town programs by Countywide Chambers of Commerce
- e. Investigate housing as an economic development tool

Goal 4: Improve Highway infrastructure in Sanilac County

Objective 1: Increase capacity of highway system within Sanilac County to relieve congestion along major corridors and to help increase the transportation of goods throughout the county.

Proposed strategy:

- a. Establish a working committee to identify the extent of need, explore options and prepare recommendations for increasing highway infrastructure capacity

- Goal 5: Support maintaining existing rail infrastructure and targeted new rail construction to support anticipated development**
- Goal 6: Encourage development of water and sewer capacities including new as well as expansion of existing**
- Goal 7: Encourage new industrial and expansion of existing industrial parks**
- a. Encourage use of and incentives available for Brownfield opportunities -contaminated and under utilized or obsolete structures.
- Goal 8: Support increased coordination of marketing & promotion of Sanilac County**
- Goal 9: Encourage workforce training for workers & quality of life**

ENVIRONMENT

- Goal 1: Promote alternative use and waste disposal methods and encourage the use of a wide range of recycling methods and operations**

Possible strategies:

- a. Educate community regarding expected life of land fill and ways to reduce waste taken to land fill
- b. Promote & educate ISO 14001 standards for business, schools, hospitals, governmental units (end-use, package reduction, scrap reduction, etc.)
- c. Educate & encourage waste-oil recycling and re-manufacturing
- d. Expand recycling of recyclable items for households and businesses

- Goal 2: Manage natural resources so as to maintain good air, land, and water quality in Sanilac County**

Objective 1: Develop and implement a Countywide Watershed Plan

Objective 2: Eliminate or reduce sources of identified pollution

Possible strategies:

- a. Promote education and implementation of environmentally friendly nutrient and pesticide practices
- b. Provide for special disposal of household hazardous waste
- c. Address and implement solutions to environmental problems due to septic system failures and run off water including cities & villages as well as agriculture.

Objective 3: Review the Sanilac County Solid Waste Plan and revise as necessary on a regular basis

LAND USE

Goal 1: Provide municipalities with recommended strategies and tools to promote voluntary participation in programs and strategies to manage growth, and preserve farmland and open space where desired by local governments

Recommended Strategies:

- a. Sanilac County Planning Commission work with municipalities to develop and update regularly an approved General Development Plan for Sanilac County
- b. Encourage clustering of new commercial, industrial and housing development near existing or planned water, sewer and roads
- c. Encourage clustering of suitable types of residential development and open space in Agricultural areas on non-farmable land to preserve prime farmland where possible
- d. Work with county and municipal professional organizations to pursue State legislation, financing and tools to preserve farm land while allowing farmers to sell property, or development rights, at fair market values
- e. Encourage the Sanilac County Board of Commissioners to pass enabling legislation as required to allow local townships to take advantage of state programs to preserve farmland and open space
- f. Sanilac County Planning Commission promote educational workshops on the use of all tools and techniques available to manage growth and preserve farm land and open space

Goal 2: County facilitate communication among municipalities and provide assistance in Future Land Use planning

Recommended Strategies:

- a. County hire a planning staff person to provide planning support to municipalities
- b. County collect land use and zoning information and put in Geographic Information System mapping format and provide information and mapping assistance to municipalities

Goal 3: Encourage cooperation among governmental units and facilitate opportunities for dialogue on potential impacts of assessing, planning and zoning on neighboring governmental units

Recommended Strategies:

Work with municipalities to develop a set of proposed recommendations and guidelines to:

- a. Help municipalities work to preserve larger tracts of land where desired

- b. Develop a review process where the Sanilac County Planning Commission can provide input to local municipalities on certain types of proposed development projects
- c. Develop a detailed review checklist outlining the various areas where potential impacts need to be assessed when reviewing proposed development projects

Goal 4: SCPC provide review of all proposed plans and/or projects initiated by the county to assess potential land use impacts, ensure compatibility with the County's approved General Development Plan and provide comment and recommendations to the Board of Commissioners and county departments regarding proposed projects.

Recommended Strategies:

- a. Board of Commissioners authorize planning commission to assume role of reviewing all county-initiated proposed plans and/or projects consistent with P.A. 282 of 1945, as amended.
- b. SCPC adopt review procedures acceptable to the Board of Commissioners

PUBLIC FACILITIES / SERVICES

Goal 1: Expand educational and training opportunities in the county to meet current and anticipated future needs (2 & 4-year plans)

- Objective 1: Promote a post-secondary program to provide daytime classes and to include technology-oriented training
- Objective 2: Implement alternative education opportunities at the secondary level including Adult Education
- Objective 3: Support education for citizens on use of new technologies
- Objective 4: Promote all educational facilities in Sanilac County obtaining access to high-speed Internet and connected via fiber optic cable

Goal 2: Prepare and update regularly a plan for maintaining and expanding county facilities as required

- Objective 1: Require Building Committee to develop comprehensive maintenance & enhancement program and functions of County buildings, facilities, and use functions.

Goal 3: Maintain recreational opportunities in the county

- Objective 1: Support Development of County Park *system* with associated programs including associated enhancements as well as natural resources.

- Objective 2: Continue public access to Lake Huron by preserving public ownership of existing parks and public access sites
- Objective 3: Promote and support coordination of recreational opportunities, festivals and events
- Objective 4: Promote water safety education programs

Goal 4: Maintain and expand countywide emergency services systems.

- Objective 1: Support full time Emergency Management Coordinator Position
- Objective 2: Support program for training and retaining emergency services personnel
- Objective 3: Promote public education on unified emergency services
- Objective 4: Identify and obtain proper funding for Emergency Service equipment to be updated, maintained at a high level and routinely enhanced to meet the needs of the County

Goal 5: Expand medical services and facilities to meet the needs of the children, families, elderly and disabled residents of the county.

Possible strategies:

- a. Support development of Air-Med and Helipad facilities for emergency medical purposes
- b. Support Thumb Area Health Needs Assessment and their recommendations
- c. Promote development of Assisted Living and Additional Senior Housing
- d. Support the effort of medical community to provide respite-care for family care givers of dementia patients.
- e. Promote recruitment and retention of Healthcare Professionals.
- f. Support a Discount Prescription Program for the residents of Sanilac County.

Transportation

Goal 1: Improve the condition of major roads throughout Sanilac County

Objective 1: Improve inter-county roads & trunk lines

- a. Annually review the primary road maintenance, repair and upgrading plan
- b. Communicate/educate the communities on the primary road plan to ensure continued support for road millage
- c. Communicate with neighboring counties and state agencies on general plans and specific projects that border their communities

Objective 2: Improve intra-county and trunk lines to connect all existing commercial centers

- a. Continue to work with the Michigan Department of Transportation, the decision-maker on these highways

Objective 3: Continue to repair and maintain the County Primary road system.

- a. Annually review the primary road maintenance, repair and upgrading plan
- b. Communicate/educate the community on the plan to secure support for continued road funding
- c. Pursue goal of all-season (Class A) status on all county primary roads
- d. Communicate with neighboring counties and state agencies on general plans and specific projects that border their communities

Goal 2: Improve public transit service for county residents without motor vehicles

Objective 1: Expand service to provide line service in addition to current on demand service

Possible Strategies:

- a. Increase promotion of available services
- b. Investigate charter service option to support tourism goals
- c. Educate consumers on living with handicapped community
- d. Examine schedule to provide line service during work commute hours only
- e. Investigate Park and Ride facilities for carpooling and other transportation demand programs with transportation specialist with the East Central Michigan Planning and Development Region

Objective 2: Improve and Coordinate shuttle service with adjacent counties.

Possible Strategies:

- a. Develop partnership when available
- b. Investigate charter service organization to provide direct service to destinations in adjacent counties to overcome county line barriers

Goal 3: Improve capacity and services of existing airports to serve the growing needs of Sanilac County residents and businesses

Objective 1: Support expansion of facilities and runways and acquisition of required technology to increase capacity and services of existing airports

Possible strategies:

- a. Support lengthening of runways an additional 4,000 - 5,000 feet and acquiring of GPS technology at Sandusky Airport to allow for expansion of Commercial Air Service
- b. Support expansion of Marlette Airport runways to 7,000 feet to overcome barriers to use.
- c. Work toward becoming an International Airport
- d. Education - positive aspects of an airport to a community
- e. Establish compatible zoning in an airport area
- f. Use the services of the county economic development organization in surveying business leaders on their air cargo/passenger needs. A determination of demand is critical in supporting funding requests for airport expansions/improvements.

Local Control

Goal 1: The County General Development Plan shall not in itself be a threat, lend itself to becoming a threat or be an active barrier to the loss of local control of land use planning.

Recommended strategies:

- a. Include language in the County's General Development Plan stating that:
 - ◆ "Townships or municipalities shall not be bound by any provision of the County's General Development Plan unless specifically adopted by said township or municipality."
 - ◆ "The County's General Development Plan, nor any portion thereof, may not be used as the basis for denying county funding to any Township or Municipality otherwise entitled to such funding."
 - ◆ "If P.A. 264 of 2001 is amended, repealed, or superceded by any legislation, the County Planning Commission and Board of Commissioners shall review and amend the Plan if necessary after public notice and input as required by state law."
 - ◆ "Terms not defined in this section shall be interpreted under existing law as of the date of adoption of this plan."
- b. The General Development Plan, and any subsequent amendments to the Plan, will be submitted to the Board of Commissioners for final approval. Prior to approval, the final draft of the County General Development Plan (Plan), or any subsequent amendments, shall be posted on the Sanilac County Planning Commission's web site for public review for a minimum of two weeks. A copy shall also be forwarded to all townships and municipalities for review and comment. The Planning Commission will conduct a public meeting to obtain public input on the final draft Plan, or amendments, prior to adoption of the Plan or amendments by the Planning Commission or the Board of Commissioners.
- c. The SCPC shall post copies of all documents related to the County's General Development Plan, a schedule of meetings and minutes of all meetings on the SCPC's web site. The documents shall be organized in such a manner that citizens with Internet access can review the latest plan, amendments and activities related to the Plan. The SCPC shall make such documents available for review by the general public at all normal hours of the County office.

Goal 2: Property taxes shall not be increased to support or subsidize any provision of the County General Development Plan unless approved by the Sanilac County Board of Commissioners or the voters of Sanilac County